ON

GASTRO-ELYTROTOMY.

BY

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[*REPRINTED FROM THE NEW YORK MEDICAL JOURNAL, OCTOBER AND NOVEMBER*, 1878.]

NEW YORK:
D. APPLETON AND COMPANY,
549 & 551 BROADWAY.
1878.

TO

THEODORE GAILLARD THOMAS, M. D.,

THE REINVENTOR, IMPROVER, AND SUCCESSFUL PERFORMER OF GASTRO-ELYTROTOMY.

ERRATA.

Page 7, fifth line from bottom, for "lacunæ," read "lacunar."

Page 8, second line from bottom, for "1835," read "1825."

Page 13, eighth line from bottom, for "1824," read "1825."

Page 27, ninth line from top, for "vagina," read "bladder."

ON GASTRO-ELYTROTOMY.

THE fearful mortality resulting from the Cæsarean section has given rise to the ardent desire of finding a substitute that might give better chances for the recovery of those women whose conformation is such that it does not allow the passage of the fœtus through the pelvis. Therefore were invented, on the one hand, *symphysiotomy* (Sigault, 1768), and its offspring, *pubiotomy* (Stoltz) and *pelviotomy* (Galbiati), and, on the other, *gastro-elytrotomy*, or *laparo-elytrotomy*. The first of these operations was at one time quite in vogue, and is still mentioned in all text-books, although abandoned long ago as entirely worthless, except in Italy.[1] The other was noticed so little that it was *invented* three times in different countries before it was reinvented in this country, and came into notoriety through the splendid results obtained by Dr. Theodore Gaillard Thomas, of New York, and his follower, Dr. Alexander J. C. Skene, of Brooklyn, New York.

[1] During the last five years symphysiotomy was performed nineteen times in the hospital of Naples. Fifteen patients recovered; four died. Three of the children died.—("Annales de Gynécologie," vol. viii., p. 317; reported in Howitz's "Gynecological Communications," vol. i., No. 3, p. 114, Copenhagen, 1878.)

History.—Medico-historical researches are difficult in a young country, in which, in spite of laudable efforts and great progress, the scholar looks in vain for the facilities afforded by the large public libraries of European cities. In order to ascertain the true history of gastro-elytrotomy, I have been obliged to bring under contribution the private and public libraries of New York, Boston, and Washington, nay, even to have recourse to the libraries of Copenhagen (Denmark). Even those most interested in the operation know little about its history. Most books on midwifery do not even mention the operation. The few that do, all give more or less erroneous descriptions of its performance and its results. It is therefore absolutely necessary to go to the original sources in order to get accurate and complete information on the subject.

The history of this operation may naturally be divided into two parts—the age of projects and attempts, in which we find Joerg, Ritgen, Physick, L. A. Baudelocque, and Charles Bell; and the age of fulfillment, belonging to Drs. T. G. Thomas and Skene.

The first group may again be divided into those who merely proposed the operation—Joerg, Physick, and Charles Bell—and those who tried it—Ritgen and Baudelocque, Jr.

Before going further it will be necessary to say what is the character of the operation, for the above-named authors and surgeons have by no means all advocated or tried the same procedure; but there is something common in their aim which makes a unit of the different plans and attempts. All try to *avoid opening the body of the uterus*, as done in the Cæsarean section, while some open the peritoneal cavity, others not; some incise the vagina, others the neck of the womb, or both together.

First Period—Projects and Attempts.—As early as 1806 the German obstetrician Joerg[1] proposed to make the Cæsarean section in such a way as to avoid the incision of the body of the womb. After having incised the abdominal wall in the

[1] Joerg, "Versuche und Beiträge geburtshülflichen Inhalts," Leipsic, 1806, p. 263; "Handbuch der Geburtshülfe," 1807, sec. 384, and new edition, 1833, sec. 512.

linea alba, he advises to open the vagina, and, if this does not give space enough, the os uteri, by an incision, and extract the child through this artificial opening. He felt justified in making this proposition from the experience of several accoucheurs who had seen the child pushed through a rupture in the vagina into the abdominal cavity. He had only once performed Cæsarean section, on a dead woman, and in that case he saw that he could extract the child very easily by incising the lower part of the uterus only. He thought that an incision here would be less dangerous and would heal more readily than the artificial opening in the middle of the uterus.

To Joerg, then, belongs the honor of having first enriched science with a proposal falling under the head of gastro-elytrotomy; but, in the first place, he never tried his plan in practice, and, next, his plan, as it is, is open to a good deal of criticism. First, he incises the peritonæum, in which respect he is inferior to most of his successors. Second, he makes the incision in the middle line, which would leave a comparatively great distance to the point in which the deep incision is to be made, and from which the child shall be taken, and diminish the advantage gained by tilting the uterus on one side during delivery. Third, if he had carried out his plan of incising the side-wall of the vagina, and carrying up the incision into the neck of the womb—in other words, making a longitudinal incision in the direction of the axis of the pelvis—he would have endangered the ureter of the corresponding side very much. Fourth, if, as in his second proposition, he incised only the lower segment of the womb in front, he would, indeed, avoid the ureter and the large uterine vessels, but, on the other hand, he would incise a part much less contractile than the body of the uterus, and, consequently, the vessels divided would be apt to give a fatal hæmorrhage.

In 1820, Ritgen,[1] another German professor, took a great step forward, proposing to operate *without opening the peritonæum*. He acknowledges his obligation to Joerg on one

[1] Ritgen, "Die Anzeigen der mechanischen Hülfen bei Entbindungen," Giessen, 1820, pp. 406–7, and 441–446.

hand, and to Abernethy and Cooper on the other, the first having proposed the incision of the vagina, the two others having taught how to ligate the external iliac artery without opening the peritonæum. He regards the time following close upon the spontaneous rupture of the membranes as the most favorable for operating. Before the rupture the vagina is too little extended, later the head has too much difficulty in passing the os on account of the resistance offered by the pelvis. Yet, even if the head be already fully engaged in the os, or still more advanced, the operation is still indicated. If the vagina has ruptured spontaneously, the same incision ought to be made through the abdominal wall, including the peritonæum.

On account of the greater distance between the rectum and the ilio-pectineal line, the incision ought to be made on the right side. The patient is placed on her back, the sacral region considerably elevated on a firm cushion, the head, neck, and shoulders raised on pillows, and the thighs and legs stretched out.

He describes the *modus operandi* in these words: "1. The accoucheur takes his place at the right side of the pregnant woman, introduces a male catheter, pushes the bladder toward the left side, and gives it in charge to an assistant. Another assistant, standing at the left of the woman's chest, places one of his hands flat in the middle line, under the umbilicus, the other toward the left, and draws the uterus toward himself and away from the right side of the pelvis, by doing which he also puts the skin to be incised on the stretch. 2. A semi-lunar incision is made from the region of the crista ilii to the neighborhood of the *symphysis pubis*, at a distance of barely an inch from the bones in this region. 3. Next, an incision is made through the muscles in the same direction, and with the precaution not to injure the peritonæum. Arteries that may have been severed, such as the epigastric, the abdominalis (superficial epigastric), and the circumflex iliac, are immediately tied. 4. Now the areolar tissue, which lies under the peritonæum, is to be separated with the fingers, the handle of the scalpel, or, if it can be safely done, with its edge, and thus the peritoneal cavity undermined, in order to come behind the walls of the vagina. 5. Then the operator intro-

duces Frère Côme's *sonde à dard*, the stylet drawn back, into the vagina, and applies the point of the instrument against the wall of the vagina so as to raise it above the middle of the *linea innominata* (or ileo-pectinea) of the right side. At the same time the assistant who lifts the abdomen draws the uterus vigorously away from the iliac and pubic bone, thereby exposing as much as possible of the deeper parts of the vagina. 6. The operator now pushes the stylet of the sound through the vaginal walls, protecting the surrounding parts with the thumb and the fore and middle finger of the left hand. 7. When the stylet has perforated the wall, a probe-pointed bistoury is passed down along its groove, and the vagina opened toward the urethra, which must not be wounded. Then the stone-sound is withdrawn and the incision extended toward the rectum, as far as it can be done without injuring this organ, using the fore-finger of the right hand as a guide. 8. When this incision has been successfully performed, so as to leave a curtain of vaginal wall two or three inches long hanging down from the right half of the uterine neck, this curtain is to be divided in the middle with a pair of scissors, up to the edge of the uterus. 9. Next, the wound is covered with a fine piece of linen soaked in warm oil, and the operator awaits the passage of the child through the wound, during which the womb must be drawn vigorously upward and toward the left. If necessary, the vaginal portion of the uterus may be incised on the right side, in order to facilitate the passage of the child. 10. After the expulsion of the fœtus the wound is cleaned, and the skin and the muscles brought together by interrupted sutures and strips of adhesive plaster. The wound in the vagina is first left alone, and later only moistened with injections of conium. A suitable bandage ought to be applied in order to prevent a ventral hernia." He says that he did not lay much stress on the unavoidable injury to the artery and veins running through the lacunæ of the vagina, the artery being so small that, when entirely cut, it soon ceases to bleed, and the venous hæmorrhage being likely to be arrested by the compression exercised by the body of the child moving forward, by the contraction of the womb during the expulsion of the

fœtus, or being easily checked, as he hoped, by tamponing the wound with a sponge.

Ritgen not only gave this detailed plan, so rich in excellent suggestions, but the following year, October 21, 1821, he had the courage to subject his views to the test of experience. As we learn as much from failures as from successes, and as the description of this first essay of gastro-elytrotomy is only found in an old German journal,[1] accessible to few of my readers, I deem it useful to translate it *in extenso*.

"The wife of Joan Peter ——, of ——, thirty-seven and a half years old, a woman of small stature and very delicate constitution, with dark eyes and hair, was delivered ten years ago of a living girl. The labor was difficult and the child was taken with the forceps. The woman gave birth to a second child, a boy, on the 24th of October, 1815, and this time the labor was a very easy one. The same was the case on the 15th of February, 1818, on which day she was again delivered of a boy.

"In the year 1819, in consequence of all sorts of depressing emotions, a cold and damp dwelling, as well as bad food, she began to sicken. Her complexion became pallid and finally earthy. She lost flesh, and her gait became so uncertain that, toward the end of 1820, she could no more leave her bed.

"The physician who attended the patient, Dr. ——, diagnosticated the disease as beginning osteomalacia, and warned her against becoming pregnant. Pregnancy occurred, however; and, when in due time he was called in to deliver her, he found the bones of the vertebral column and the pelvis distorted, the lumbar vertebræ turned inward and toward the left, the sacrum much curved at its lower end, the pubis turned inward and upward, the symphysis pubis sharply projecting, and the horizontal branch of the right pubis bent inward. The bones of the pelvis had not reached that degree of softening which allows the application of the forceps. Not long ago the same physician had succeeded in extracting two children, whose mothers suffered from still greater narrowness

[1] "Heidelberger klinische Annalen," vol. i., Heidelberg, 1835, p. 266, *seq.*

of the pelvis, but in those two cases the pelvic bones were already so flexible that they yielded to the pressure of the head seized with the forceps, and allowed it to pass.

"The inward deflection of the pubis, which caused the head of the child to overtop the pelvic brim in this place, made the doctor particularly expect success from gastro-elytrotomy. He therefore applied to me in order that I might myself perform the operation as proposed by me.

"Accompanied by Dr. ——, I repaired immediately to the house of the parturient woman, where we found the necessary number of assistants. She appeared to me exactly as described by Dr. ——. I found her very thin, with small, rather quick pulse, but without fever. She was entirely resigned as to the pain and the possible result of the operation. She wished only to have the child saved, and complained of great weakness. Labor pains had begun in the forenoon of the preceding day, had disappeared toward evening, had set in again during night, and increased until five o'clock in the morning. Since then they appeared with intervals of eight to five minutes. By external and internal examination, I verified the statement of Dr. —— in regard to the conformation of the pelvis and the vertebral column. The womb was normally shaped, the fundus and body lying more in the left, the neck more in the right side of the mother. The os was felt soft and swollen, and presented a dilatation of two and a half inches in diameter. The occiput of the child was directed toward the right sacro-iliac articulation, and the left parietal bone overtopped the right pubis of the mother, which was bent inward. Although the promontory was very easily reached on account of the curvature of the sacrum, the head stood pretty high, because the projection formed by the last two lumbar vertebræ prevented it from descending. With the hand and my pelvimeter I made out the measures of the pelvic brim pretty accurately as they were found after the death of the patient.

"I wished to delay the operation until the head was passing through the os, in order to be able to extract the child quickly after having made the incision, but the great weakness of the patient made it dangerous to wait for this. The bowels and

the bladder having been emptied, and the patient having taken an opiate, the operation was begun at 10 A. M. The patient was placed on her back, on a solid table covered with a mattress, pillows, and a large piece of oil-cloth. All precautions usual in Cæsarean section were taken, and the necessary instruments at hand.

"I made the incision through the skin on the right side in the way prescribed above, and likewise that through the muscles. The epigastric artery, that had been cut, was tied, and the walls of the vagina exposed on the right side, the areolar tissue being easily separated with the fingers. I passed the handle of my wooden pelvimeter into the vagina, pressed the knob of this instrument against the roof of the vagina, and raised it at the point where the pubis was most bent inward. Having charged the first assistant with holding the pelvimeter, I incised the vagina at the raised point with a convex knife, and dilated the opening with the probe-pointed knife, guided by the forefinger of the left hand near up to the urethra, the incision extending one inch and a half in length. The bleeding from the vessels severed in the vaginal wall was quite insignificant, and stopped immediately by itself.

"Next I dilated the incision one inch and a half backward, but I had scarcely incised the last inch when a stream of blood filled the wound and poured out, whilst another traversed the vagina. Without delay I pushed a sponge soaked in cold water which lay near by into the wound, thereby checking the hæmorrhage immediately and perfectly. Now we waited for the next labor pain, which was weaker than the preceding ones, and did not move the child forward in any perceptible degree. I resolved, therefore, to incise the os uteri during the next pain, and extract the head of the child; but, on withdrawing the sponge, the blood came again rushing out so violently that I was obliged to desist from this intention, and replace the sponge in the vagina. We resolved, if possible, to leave the expulsion of the child to Nature's own efforts, the sponge stopping the hæmorrhage completely. Therefore, half an hour was spent in restoring the patient, and furthering labor pains by the administration of wine, tincture of cinnamon, etc., but the contractions of the uterus had entirely

ceased, and the strength of the patient was failing fast. In order to save the child, that still made lively movements, immediate help was necessary. It was feasible to perform pubiotomy, and on account of the softened condition of the bones a ready yielding of the sacro-iliac symphyses without any rupture could be expected; but, on the other hand, the sponge which checked the bleeding would thereby loose its hold, and the child would not be born immediately. Neither could a return of the hæmorrhage from the vaginal wound be avoided by podalic version. While we were consulting as to the course to be adopted, the patient fainted. I examined the interior of the vagina, but did not find any extravasation of blood there. The patient having rallied, I quickly seized the knife and performed the ordinary Cæsarean section. Within a few moments I extracted a large boy, having all the signs of a vigorous life. I made the Cæsarean section in the direction proposed by Stein, Jr., beginning at the right of the umbilicus, and carrying the knife near to the middle of the left horizontal branch of the pubis.

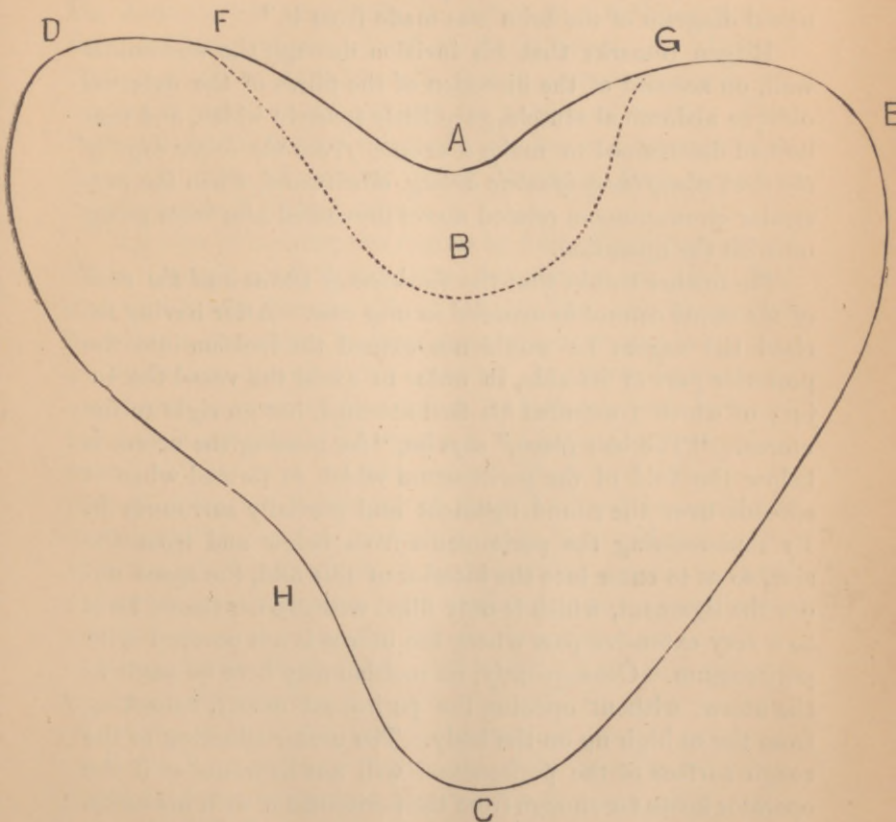
"No ligature was needed after the incision through the muscles and before opening the peritoneal cavity. The intestines did not protrude after the opening of this cavity. The bleeding from the uterus was trifling. While I handed the child to the midwife, Dr. —— had approached the patient, and, when I returned to her, he had already withdrawn the after-birth. I saw that the womb had by no means contracted fully. I therefore passed my right hand through the oblique wound in the uterus, and placed my left hand on the fundus uteri, which was intact, and endeavored to make the womb contract in the way recommended by Wigand. This succeeded after a few minutes. Then the parts surrounding the contracted womb were examined, and no extravasation of blood into the abdominal cavity was discovered. Now the sponge was removed from the wound in the vagina, and, as I had expected, no more blood flowed from it. Next, the abdominal walls were united at both incisions with sutures and straps of adhesive plaster going round the whole abdomen. Finally, a many-tailed flannel bandage was applied round the abdomen, and the patient brought to bed a little before 11

o'clock. She had recovered somewhat, and rested content with having given birth to a healthy child."

The family physician insisting on the application of woolen cloths soaked in an infusion of resolvent herbs, made with wine and used as hot as the patient could bear them, while Ritgen held them to be very dangerous in regard to internal hæmorrhage, the latter withdrew from active participation in the treatment of the patient, and continued only to watch it. As the prescriptions do not present anything of interest, I will not reproduce them here, and merely give the description of the further course of the case. The night between October 1st and 2d the patient was quiet, free from pain, and slept pretty well. In the morning of the 2d her pulse was rather quick and very small. She was very weak. No fever present. The lochial flow was scanty. The night between the 2d and 3d was passed without sleep. After two loose passages her strength lessened till morning, when she again rallied somewhat and became a little feverish. The urine was passed without any disturbance. Toward 10 A. M. the abdomen began to swell, the patient became restless, and the fever augmented. The meteorism seemed especially to be seated in the colon. The patient's strength diminished, while the distention of the abdomen increased, and breathing became very difficult. The heat was all the time very moderate. Toward evening it disappeared altogether, and death ensued at 8 P. M.

Post-mortem examination forty-eight hours after death. "The edges of the wounds were without any trace of suppuration, and even without considerable inflammatory swelling. Here and there the opposite surfaces of the wound were slightly glued together, but in several places no union had taken place. The peritonæum did not show any inflammatory redness around the wounds or anywhere on the anterior wall of the abdomen. Nowhere in the abdominal cavity was there found any extravasated lymph. The interior surface of the cæcum and a small part of the ascending colon displayed here and there spots of the size of a cent, in which a red vascular net was discernible. The whole colon was much distended with gas. The womb had relaxed,

and measured from the fundus to the mouth eleven inches; the body measured almost six inches in width. The wound in the uterus was wide open, and filled with coagulated blood, thick clots of which also filled the interior of the whole womb. The amount of blood contained within the womb was estimated at a little less than a pound. Above and behind the



PELVIS OF WOMAN ON WHOM RITGEN PERFORMED GASTRO-ELYTROTOMY.—Heidelb. klin. Annal., vol. i., 1824.

D C E, superior strait; *D*, region of right sacro-iliac symphysis; *E*, region of left sacro-iliac symphysis; *C*, symphysis pubis; *H*, depression of right pubic bone; *F A G*, lower border; *F B G*, upper border of lowest lumbar vertebra.

Measures in American inches, added by me; *A C*, 3¼ inches; *D C*, 4½; *E C*, 4$\frac{1}{16}$; diameter sacro-cotyloidea, right 2, left, 2$\frac{5}{16}$.

womb, extending up to the diaphragm, was found a fluid extravasation of blood amounting to a little more than a pound.

No traces of inflammation were found around the extravasated blood. The other abdominal viscera were entirely normal. The large blood-vessels contained very little blood. The cavities of the head and the chest were not opened. The vaginal wound had not united, the edges having been partly separated by the distention of the colon, and no plastic lymph having been secreted by them. The pelvis was cut out, and the annexed diagram of the brim was made from it."

Ritgen remarks that his incision through the abdominal wall, on account of the direction of the fibres of the external oblique abdominal muscle, gave little space in width, and that he had determined to make *a second, from the lower edge of the first, along the epigastric artery, downward*, when the particular circumstances related above prevented him from going on with the operation.

He further thinks that the *incision of the os and the neck of the womb cannot be avoided in any case.* After having incised the vagina he would not extend the incision into the posterior part of its side, in order to avoid the vessel the injury of which frustrated his first attempt, but go right to the uterus. "The best place," says he, "for incising the uterus is below the fold of the peritonæum which is formed when it spreads over the round ligament and partially surrounds it. By undermining the peritonæum from below and from the side, so as to enter into the interior of this fold, the space under the ligament, which is only filled with areolar tissue, leads to a very extensive part where the uterus is not covered with peritonæum. Consequently, an incision may here be made in the uterus without opening the peritoneal cavity, extending from the os high up on the body. The ureter adhering to the rough surface of the peritonæum will not be wounded if the operator keeps far enough from the peritonæum with his knife. Cooper's hernia knife, which, behind the blunt point, has a cutting edge of only one-half of an inch in length, is therefore the most suitable instrument to be used in this locality. The incision ought to begin at the os, and may be carried five inches upward. We need not say that, as soon as the incision is made, the child has to be extracted, in order that the

hæmorrhage from the opened wall of the womb may be arrested by the contractions of the whole organ."

Before criticising any particular point I would call attention to the lucidity of Ritgen's description. We follow him, both in his plan and in his operation, step by step. Nothing is left to conjecture. He speaks with worthy calm of his invention, and gives honestly all details about his failure. In his modesty and simplicity he differs in a striking manner from the vainglorious and verbose Baudelocque. *It is Ritgen's lasting merit to have been the first to propose gastro-elytrotomy with avoidance of opening the peritoneal cavity.* Thus he is, from an historical point of view, the real inventor of an operation that, resuscitated in an improved form, seems to have promise of a great future.

His idea of incising the vagina by following the groove on Frère Côme's *sonde à dard* was not very good. This incision would have become almost longitudinal, and we see that he wants a transverse incision, since the next step is to make a longitudinal one up to the os uteri. In thus recommending a ⊥-shaped incision of the vagina, he took too little notice of the vessels running in the parts to be incised, and would almost infallibly have cut the ureter. If he had followed his plan of using the forefinger of the *right* hand as a guide in extending the incision, he would have been obliged to cut with the left hand, which in so delicate an operation would embarrass most operators. In performing the operation he arranged it so as to use the left forefinger as a guide, which, of course, is the simpler way. By keeping a metallic catheter in the bladder during the incision it will be easier to avoid wounding it with the cutting instrument; but it ought of course to be withdrawn before the child is extracted or expelled, in order to prevent injury to mother and child. His recommendation to wait for the child, till it is expelled by the unaided efforts of Nature, is not good. The sooner the operation can be ended, the better, on account of anæsthesia, disinfection, checking of hæmorrhage, etc. His operation failed in consequence of hæmorrhage. The first incision and the extension forward one and a half inch succeeded, but in cutting backward he caused a hæmorrhage that forced him to desist

from his plan. This was evidently due to the vaginal branch that is running downward along the border of the vagina from the uterine artery. If, instead of cutting, he had torn, he would probably have been able to bring his operation to an end. Having been unsuccessful in his first attempt, he proposed alterations in his plan by which he made it more unlike the operation as it succeeded in other hands, half a century later. He proposed to make the external wound T-shaped, which would make it more difficult to heal, and weaken the abdominal wall still more, and which later experience has proved to be an unnecessary injury. His second proposal, to incise the edge of the uterus between the folds of the peritonæum as high up as five inches from the os, is so far from being an improvement that I think it is inferior to the common Cæsarean section. Even if he succeeded in avoiding the ureter, he would cut exactly in the part of the uterus where the largest vessels are situated, and which has not the same contractile power as the part incised in Cæsarean section. He mentions the circumflex iliac artery among those that may be severed by the incision through the abdominal wall; but this vessel is out of the way when the incision is made, as prescribed by Ritgen, an inch above Poupart's ligament. It takes its course behind the ligament and inside the crista ilii. He operated when the os was only two and a half inches in diameter. In such a case the os would have to be dilated first, which, with our present resources, could be done without difficulty. To use the handle of an instrument or a sound for lifting up the vagina and incise upon it is not so safe as to use the fingers. By following the latter plan the operator is enabled to feel for pulsating vessels, and perhaps avoid them, as Dr. Skene did. Even when operating on the right side, and consequently being obliged to introduce the right hand into the vagina, he would be able to make the first incision in the vagina with a knife carried in the left hand. But, as we shall presently see, other instruments are preferable.

August 19, 1823, L. A. Baudelocque ("the nephew") defended in the Medical School of Paris a thesis called: "*Nouveau procédé pour pratiquer l'opération césarienne*," and on the 14th of November of the same year he read before the

Cercle Médical a paper on the same subject, published at Paris in 1824 under the title: "*Nouveau moyen pour délivrer les femmes contrefaites à terme et en travail, substitué à l'opération appelée césarienne.*" He called his operation *gastro-elytrotomy*, and conceived such high opinion of its value that he says that the Cæsarean operation, hitherto so terrible for the mother, can no more take her life (p. 10)! Having placed the patient on her back, he advises to make an incision along the external edge of the rectus abdominis from the umbilicus extending to two inches above the pubis. This is done so as to preserve the peritonæum intact. Then he ruptures the membranes from the vagina. Next he separates the peritonæum from the iliac fossa by the finger introduced into the lower end of the wound. An assistant lifts the peritonæum and the intestines, while another fixes the uterus. The operator introduces his hand into the abdominal wound and feels for arteries surrounding the vagina. If he finds any, he ties them at both extremities. He feels likewise for the round ligament, in order to be able to avoid it later. The bladder and rectum are emptied.

Next he introduces his left hand into the vagina and pushes it through the external wound. With the right hand he seizes a bistoury and incises the vagina through the external wound, as far below its junction with the uterus as possible, and extends the incision to a length of four inches and a half. The expulsion of the child is left to Nature, or if not expelled it is extracted with a short forceps.

He proposes, as another method, to comprise the peritonæum in the incisions. He chooses for the operation the side opposite to that in which the fundus uteri is situated. He removes the placenta through the natural passage after having replaced the uterus.

In 1844 Baudelocque published a new pamphlet on the subject, under the title "*Opération césarienne.—Élytrotomie, ou section du vagin, précédée, ou non, de la ligature ou de la compression de l'artère iliaque interne.*" In this the original plan is much modified. He advises (page 11) to make an incision extending from a point twenty lines (about one inch and three-quarters) outside of the spine of the pu-

bis to another a little above the anterior superior spine of the ileum, leaving the round ligament inside. After having separated the peritonæum as described above, he introduces between the internal iliac artery and vein a female catheter, through the eyes of which is drawn a thread, and ligates the artery. Next he thrusts the bistoury from without through the side-wall of the vagina beneath the ureter, which is found one centimetre (three-eighths of an inch) below the neck of the womb; or he introduces a sound with stylet (*sonde à dard*) into the vagina with the left hand, making counter-pressure with the thumb and forefinger of the right hand, at the place where the point is felt. An assistant pushes the stylet forward, and the operator dilates with a probe-pointed bistoury, from above downward, the puncture made in the vagina. He turns and extracts the child. The child having respired, the cord is cut, put back into the vagina, and the placenta removed through the normal passage. Likewise, both ends of the ligature round the internal iliac artery are drawn forth through the vagina. The edges of the external wound are brought together with three or four sutures that do not comprise the peritonæum, and the wound is dressed. The patient being replaced on her bed, the abdomen is covered with ice for several days, in order to prevent peritonitis.

After laying down this plan for the operation, he reports two cases in which he had tried it:

Case I. (*l. c.*, page 12).—Date of operation not indicated. The patient was thirty-six years old, primipara, rickety, only a metre (about thirty-nine inches) high. She had first begun to walk when eleven years old, and then with a crutch. During her pregnancy she could only walk on two crutches. The brim of the pelvis was very irregular, wider in the right than in the left half, with an antero-posterior diameter of two inches and a half. The os was four centimetres (little more than one inch and a half) in diameter. The waters had broken spontaneously, and flowed out in great quantity. The operation is described in these terms:

"I made through the skin of the left iliac region an incision beginning twenty lines (one inch and three-quarters)

from the spine of the pubis, and ending two centimetres (three-quarters of an inch) in front of and a little above the anterior superior spine of the ileum. Next I incised, layer after layer, the external oblique, the internal oblique, and the aponeurosis of the transverse muscle. During this incision an endless number of small arteries gave blood, and were immediately tied. At the lower angle of this incision I made a small opening in the transversalis fascia, through which I introduced a probe-pointed bistoury, and cut the fascia from below upward. Then, passing my left forefinger between the peritonæum and the iliac muscle, I separated this membrane from the muscle through its whole extent, down to the vagina. The internal iliac artery and vein having been exposed, I pressed the point of the bistoury against the external surface of the vagina, one centimetre and a half (five-eighths of an inch) beneath the ureter, i. e., about twenty-seven millimetres (a little more than an inch) below the neck of the womb. This simple puncture of the vagina caused such a flow of blood that instantly the iliac fossa was filled. I sponged it immediately, but it was filled again twice. This loss of blood, although not considerable in itself, was sufficient to weaken this woman; we saw her natural pallor increase and her eyes turn in their orbits. My assistant tamponed speedily the outside of the vagina and the iliac fossa with sponges, and I performed immediately hysterotomy, extracting a child that had died quite recently. I removed the placenta through the wound in the uterus, and united the edges of the anterior wall of the abdomen by six interrupted sutures. The wounds were dressed simply, a binder applied round the abdomen, and the patient brought to bed."

He adds that the hæmorrhage came from the vaginal veins, that he ought not to have been so frightened by it, and that compression exercised with a finger on the common iliac artery would have stopped it and permitted him to go on with the operation. The patient again lost blood during the incision of the uterus, and continued bleeding from the lips of the uterine wound and from the vaginal veins, until she died from hæmorrhage. Time of death not indicated. The autopsy showed *anæmia*.

Case II. (*l. c.*, page 14).—May 6, 1843. Age and number of pregnancy not stated. Pelvis ten centimetres (almost four inches). Eclampsia.

"The woman having been placed on a table covered with a mattress and sheets, I chose, as in the first case, the left inguinal region. The incision of the skin and the muscles did not present anything remarkable except the necessity of applying about thirty ligatures. The separation of the peritonæum was very easy. After having separated, with the end of a female catheter, the internal iliac artery from the accompanying vein, I passed under this artery a Deschamp's needle, through the eye of which I had drawn a flat thread; but, at the moment I carried it round the artery, the peritoneal sac slipped from the hands of the assistant, so that for an instant I did not see the point of the instrument, which met the external iliac artery and pricked it, although the needle was rather blunt. A small continuous stream of blood appeared instantly, and I was obliged to tie the *common* iliac artery. After having passed the left hand into the vagina, and having raised on the tips of my fingers the part of the vagina that was to be incised, I perforated it from without with a straight and pointed bistoury. Next I extended the incision with a probe-pointed bistoury from above downward, in order not to injure the ureter. Then passing the same hand through the vaginal wound into the uterus, I seized the feet of the fœtus, whose head presented at the brim, and turned it with the greatest facility. The child was dead, the mother having had an attack of eclampsia, with loss of consciousness, before I performed the operation. As to the after-birth, I extracted it through the natural channel, having replaced the cord through the vaginal wound.

"The edges of the external wound having been brought together with strips of adhesive plaster, and covered with lint, I replaced the patient on her bed. She felt then so well that she wanted to get up and take some food. For about twenty-four hours she complained of numbness in the left leg. After that the numbness disappeared entirely, and the heat returned in this extremity so as to become greater than in the right leg. Thus, on the third day after the operation, we could

consider Mrs. D. as cured of the ligature of the common iliac artery. Nevertheless, this accident prevented me from combating, with as much energy as I else would have used, the inflammatory symptoms appearing in the abdomen. The following day the abdomen was distended, the patient had pain in some places, the wound looked bad and smelled slightly gangrenous; normal lochial discharge; fever. Twenty leeches were applied to the tender parts of the abdomen, and twelve drops of laudanum in a little sweetened water administered internally. The next day the tympanites was considerable, vomiting set in, the odor from the wound was much more marked, abundant suppuration, fever. Phlebotomy and fifteen leeches on abdomen. The blood withdrawn from the vein and by the leeches amounted in all to 500 grammes (about 16 ounces). In spite of this rather active treatment in a woman of so small a stature (height not stated), the inflammatory symptoms increased, the tympanites became excessive, although the pain in the abdomen had ceased, and on the fourth day Mrs. D. vomited continually, her extremities grew cold, her face became blue; briefly, she was asphyxiated in consequence of the distention of the abdomen, and died 74 hours after the operation.

"*Autopsy.*—Distention of bowels; very slight redness of some spots of the peritonæum covering the intestines; extravasation of 80 to 100 grammes (about 3 ounces) of yellow serum; no obstacles in the alimentary canal capable of producing the tympanites; no union of the vaginal or the external wound. All the other organs were healthy.

"What has caused death? Is it the slight injection of the peritonæum? I do not think so. Is it the opium that was given to calm the abdominal pain, and that produced the paralysis of the intestines, their enormous distention, and death from asphyxia? I think so."

After this second operation, he proposes (p. 17), as an improvement, to incise skin and muscles to the extent of one inch, close up to (*rasant*) Poupart's ligament, lift the peritonæum in this place in order to ligate the *anterior* iliac (*sic*) and the epigastric artery, push the forefinger of the left hand between the peritonæum and the muscles of the anterior wall

of the abdomen, use it as a guide for a probe-pointed curved bistoury, and cut in one stroke, from the inside outward, and from below upward, the muscles and the skin. This, he says, would shorten the operation considerably, because there would be fewer ligatures to apply.

In the same pamphlet (p. 23), Baudelocque proposes two other methods. The first consists in an incision in the *linea alba*, as in ordinary Cæsarean section. The uterus would protrude from the abdominal cavity by itself, or, if necessary, it should be drawn out with the hands. Incision of the mesorectum and of the *posterior wall* of the vagina from below upward. An assistant might place his forefinger on the abdominal aorta in order to prevent bleeding during the incision of the vagina. After the extraction of the fœtus, the edges of the external wound ought to be brought together and kept in apposition with the instrument invented by Baudelocque for the purpose, or with dressing-forceps surrounded with compresses and tied together by the eyes, so as to avoid sutures. If there should be any hæmorrhage from the vaginal wound after delivery, there would be no other resource than to compress for six or eight hours, with a compressor, one or both internal iliac arteries (p. 25).

The other method (p. 24) consists in a transverse incision from one anterior superior spine of the ileum to the other, through the whole thickness of the abdominal wall, ligature of both epigastric arteries, incision of the mesorectum and the posterior wall of the vagina, as in the previous method. The edges of the external wound are not sutured nor brought together by any means, as the inclination forward of the woman would bring them sufficiently together.

Although Baudelocque comes after Joerg and Ritgen in time, there is no occasion to doubt the originality of his first plan. In his first pamphlet ("*Nouveau moyen*," p. 10), he says that, of all those who tried to modify the Cæsarean section, no one thought of extracting the fœtus through the vagina. In his second ("*Élytrotomie*," p. 9), he states expressly that he first became acquainted with Ritgen's proposition in 1826, through a German physician. We have no difficulty in understanding this. Fifty years ago there was scarcely a Parisian surgeon

who was able to read a German book; and while a German periodical (Froriep's "*Notizen zur Natur und Heilkunde*," October, 1824), with that curiosity about everything, wherever it takes place, that is so characteristic a feature of German science, immediately reported Baudelocque's operation, nobody in France had noticed Ritgen's plan and operation.

On the other hand, it seems very likely that Baudelocque, before he operated on the living subject, knew all about Ritgen's plan, even if he did not know that he had tried it in practice. At least, it looks very suspicious that he does not indicate the date of his first operation, and that he made the transverse abdominal incision as advocated by Ritgen, and not his own, longitudinal, along the external border of the rectus muscle, although he expressly says in his first pamphlet that no other part of the abdomen answers so good a purpose for the external incision as the outer edge of the rectus muscle.

Passing to the consideration of the value of his plans and operations, we notice, first, their great number and diversity. Altogether, there are no less than six different methods:

1. Longitudinal incision at outer edge of the rectus muscle, without opening the peritoneal cavity.

2. The same incision comprising the peritonæum.

3. Oblique incision from the spine of the pubis to the anterior superior spine of the ileum, without opening the peritoneal cavity.

4. The same with previous ligature of the external iliac artery.

5. Longitudinal incision through the *linea alba* and the posterior wall of the vagina.

6. Transverse incision from the anterior superior spine of the ileum on one side to the opposite, and longitudinal incision of the posterior wall of the vagina.

Of all his methods he prefers the last ("*Élytrotomie*," p. 25). Consequently, he abandons the most important point, namely, not to open the peritoneal cavity. Even in his first pamphlet, which is by far the better, although not so important as the second, since it proposed only a plan that had not yet been tested in the crucible of experience, he lays most stress on avoid-

ing the uterus, and accords only secondary importance to sparing the peritonæum.

Accordingly, *Baudelocque occupies a position midway between Joerg and Ritgen, with the disadvantage of being their successor.* As to good description of cases he is much inferior to Ritgen. Most of all, he is inferior to him in so far as Ritgen's case was one undoubtedly fit for the operation, while at least one of his was not. In the first the mother might, perhaps, have been saved by using the cephalotribe, with which he had himself enriched the obstetric art. In the second, both might perhaps have been saved by employing other means. He says himself, in his particularly confident way, that he would have extracted the child alive if he had operated the evening before, *the eclampsia not having taken place then.* But why would he then have operated, since her pelvic brim was four inches in diameter, and since he does not indicate the least abnormality in her labor except the eclampsia?

The child being dead, and no deformity found in the mother, it is singular to read the conclusion he draws from this operation: "The result of this operation," says he, "removes every doubt as to the possibility of extracting a *living* child, through an incision made in the vagina, even in the worst conformation of the pelvis" (*l. c.*, p. 17). He might as well have added that the death of the mother being due to opium, proved the innocuousness of the operation, in itself, to her.

Now we will examine his plans and operations more in detail. His first incision along the outer edge of the rectus muscle would, by far, not make the separation of the peritonæum so easy as that along Poupart's ligament, proposed by Ritgen, and adopted in practice by Baudelocque. Nor would it be so easy to tilt the uterus sufficiently over on the side to make the os present in the abdominal opening. These two disadvantages are by no means counterbalanced by the fact that the epigastric artery is out of the way. This artery can either be tied without any harm, or avoided altogether. As for the vaginal incision, his advice to tie arteries that may be in the way, before making the incision, sounds plausible enough, and ought to be kept in mind by future operators;

but it is another question if it would be possible to tie them. On the other hand, it is a useful recommendation to make the incision as low as possible, i. e., as far from the uterine neck as possible, for thereby he not only avoids the ureter and Douglas's pouch, but he comes to the part of the vagina in which there are the fewest vessels. If the contraction of the pelvis be great, it may be difficult to deliver the placenta through the vagina. It is better to withdraw it through the wound.

In his third method, he makes the incision in the abdominal wall begin one inch and three-quarters outside of the spine of the pubis. By so doing he would avoid the epigastric artery, and the modern operations have proved that this may be done; and then it is of course better to do it. At the same time he avoids cutting the round ligament, part of which protruded and had to be tied and removed in Dr. Thomas's second operation. As this organ contains a small arterial twig, and seems to play a part in adjusting the uterus to the penis during coitus, thereby facilitating conception, it is of course better to spare it if it can be done without sacrificing greater interests. Baudelocque's advice to feel for the ligament, in order to avoid it, is of no use in practice. A point of much greater importance is his advice to ligate the internal iliac artery. We will not lay too much stress on the criticism pronounced by Fate when, in trying to tie the internal iliac, he wounded the external, and was obliged to ligate the common iliac artery. Even apart from this unlucky accident, the advice is not a good one. The pelvis being full of arteries with numerous anastomoses, it is very doubtful if the ligature of the internal iliac would prevent hæmorrhage from arteries cut in the vagina. Next, it would be a difficulty more for the operator, and likely to lessen the chances of the operation becoming popular with obstetricians. It would be a serious complication of an operation already grave enough. In his second operation, he says that the wound became gangrenous; perhaps in consequence of the ligature of the common iliac artery. Finally, the recent operations have shown that it is not necessary to interfere with the iliac vessels at all. His alternative to use the *sonde à dard* instead of his fingers seems to be

borrowed from Ritgen, as well as the direction of the abdominal incision, although he does not admit owing him anything. As stated above, I do not, however, consider this an improvement. The incision will become too longitudinal. It is better to feel the arteries with the fingers, and the less we use the knife in the vagina the better.

His advice to turn and extract the child instead of waiting till it is expelled is of course a great improvement on his first plan, and his last proposition of covering the abdomen with ice-bags in order to prevent peritonitis is excellent.

We will now consider his *first operation.* Since the os uteri was only an inch and a half, it ought to have been dilated before operating; if it was incapable of being so, this would constitute a contraindication for gastro-elytrotomy.

It is difficult to understand how Baudelocque can have been obliged to ligate an "endless number" of arteries, and in his second case "about thirty." Ritgen met with no bleeding, although he only ligated the epigastric artery. Drs. Thomas and Skene only forcibly compressed the external or subcutaneous epigastric artery (private communication). The only arteries of importance enough to have a name which can be wounded during the incision through the skin and the muscles are the internal epigastric (*A. epigastrica stricte, s. inferior*), and the superficial epigastric (*A. epigastrica superficialis, s. abdominalis subcutanea*). Even if a few muscular branches should spout, they would scarcely require ligature; torsion or temporary compression would be more expeditious and sufficiently safe.

The most noteworthy point in Baudelocque's first operation is the fact that, on making a simple puncture with a narrow bistoury in the vagina, he met with a hæmorrhage that made him give up the operation and have recourse to Cæsarean section; but his own remarks on the subject, as found above, seem to prove that he might have gone on. Nevertheless, this experience, combined with theoretical considerations, engages us to try to avoid all sharp instruments in the vagina. If the surrounding parts are covered with a wet compress, it must be possible to *incise the vagina with the galvano-cautery*, or *the thermo-cautery brought to red heat.* If these instruments

be not at hand, common red-hot cautery-irons may be used. The hand in the vagina must then of course be protected by a wet napkin, or some wooden instrument used in its stead.

In his *second case*, Baudelocque operated again on the left side, although there was no reason for so doing, and although he says himself in "*Nouveau moyen*" that the right side is to be preferred, on account of the greater distance between the vagina and the rectum. The left side presents only this advantage, that the operator introduces his left hand into the vagina, and cuts with the right; but, in operating on the right side, he may either cut with the left hand, as Dr. Skene did, or have an assistant raise the vagina, as Dr. Thomas did.

When he says that he made the vaginal incision from above downward, this means probably a direction parallel to the ureter and the bladder. He does not indicate how long he made the incision, but in his "*Nouveau moyen*" he says that it ought to be four and a half inches, and this can only be obtained in the antero-posterior and somewhat oblique direction. Besides, he says here expressly that the incision is to be *transverse*, and in the upper third of the vagina.

It is curious that Baudelocque tries to deny the fact that his patient succumbed to peritonitis. His theory that twelve drops of laudanum, containing even in the stronger preparation used in France only one and one-fifth grain of opium, paralyzed the bowels and killed her by asphyxia, will not find much favor in a country in which Dr. Alonzo Clark's treatment with enormous doses of morphia is regarded as the best cure for peritonitis. Not improbably the prostration due to gangrene contributed to the bad result. But, since the few lines he devotes to the report of the autopsy do not even allude to gangrene, it may also be that the odor perceived during life arose from other causes. It may be that septicæmia played a part in the process that killed her. If she died asphyxiated from the meteorism, it is noteworthy that nothing was done to relieve this dangerous symptom. Nowadays we would resort to puncturing the intestine with the hypo-

dermic syringe—which had not yet been invented when Baudelocque operated—besides other means, such as large doses of bismuth, turpentine, a long tube introduced through the rectum, etc.

His *fourth method*, previous ligature on the *anterior* iliac and the epigastric artery, is far from being an improvement. According to Sappey[1] and to the true relative situation of the two iliac arteries to one another, the anterior is the external; his advice to ligate the epigastric, which is a branch from it, separately, must be founded in fear of hæmorrhage from the distal part of the main vessel. This ligature of the external iliac is entirely superfluous, and constitutes a serious complication, the more so as the second incision, according to Baudelocque, must be preceded by the ligature of the internal iliac.

His fifth method, incision in the *linea alba* and the posterior wall of the vagina, is inferior to those hitherto considered. Not only the peritonæum is opened, but to such an extent that the uterus protrudes, and we know, from Spencer Wells's ovariotomies, that as soon as the incision exceeds five inches mortality increases with every additional inch.[2] Next, the vaginal incision is made in a place that would render both turning and the application of forceps impossible. If there came hæmorrhage from the vaginal wound it would be beyond control, for it is more than doubtful if the patient would be able to stand the compression of one or both internal iliac arteries, which Baudelocque calls the only resource. He is not correct when he says that the *mesorectum* is cut, this name designating the short mesentery found behind the upper part of the rectum. He means, evidently, the fold of the peritonæum forming Douglas's pouch.

His sixth and last method is the least good of all, as it not only opens the peritoneal cavity to a large extent, and makes the awkward vaginal incision just mentioned, but leaves the peritoneal cavity entirely open.

As for results, they could not be worse, all four lives interested in the two operations having been lost.

[1] Sappey, "Traité d'Anatomie," vol. i., part 2, Paris, 1850, p. 471.

[2] Spencer Wells, "Diseases of the Ovaries," London, 1872, p. 352.

If I have been obliged to criticise Baudelocque rather severely, it ought not to be forgotten that he always has the merit of having been one of those who originally, and without knowing that the idea was not new, conceived the plan of avoiding both the peritoneal cavity and the uterus in performing gastro-elytrotomy. He has also carefully studied every point of the anatomy bearing on the operation, and is, in this respect, more explicit than any other author on the subject.

The next author we have to deal with is an American. In a letter from Dr. W. E. Horner, adjunct professor in the University of Pennsylvania, dated September 28, 1824, and inserted in William P. Dewees's "A Compendious System of Midwifery" (seventh edition, Philadelphia, 1835, page 598), we find the following statement: "More than two years ago, it (the Cæsarean operation) being then a matter of particular inquiry with me, I was struck by the following proposition of his (Dr. Physick) in regard to it, which made a very strong impression on me, and the justness of which I have ever since been extremely anxious to verify by dissection." He next describes how, in the body of a woman in the sixth month of pregnancy which he dissected, by drawing moderately at the bladder, the peritonæum leaves the cervix uteri "after the same manner that it does in the unimpregnated state," and goes on: "Dr. Physick, founding his idea upon a similar observation made in early life, during the dissection of a pregnant woman, proposes that in the Cæsarean operation an horizontal section be made of the parietes of the abdomen, just above the pubes. That the peritonæum be stripped from the upper fundus of the bladder, by dissecting through the connecting cellular substance, which will bring the operation to that portion of the cervix uteri where the peritonæum goes to the bladder. The incision, being continued through this portion of the uterus, will open its cavity with sufficient freedom for the extraction of the fœtus. All of which the doctor supposes may be done by a careful operation, without cutting through the peritonæum. . . . Dr. Physick proposes that the operation be performed with a moderately distended bladder, and that a catheter should be introduced previously, to ascertain its situation."

Physick, then, had also, probably without knowing anything about Ritgen's plan, published two years earlier, conceived the idea of avoiding the peritoneal cavity in making Cæsarean section. As he does not aim at incising the vagina, his operation does not properly fall within the scope of gastro-elytrotomy; but it is so nearly related to it by trying to avoid the body of the uterus and the peritoneal cavity, that it may be warrantable to discuss it in this disquisition. The place he chooses has considerable disadvantages. The dissection of the peritonæum from the bladder is a much nicer anatomical undertaking than to separate it from the iliac fossa. Next, the neck of the womb has to be incised, with the unavoidable hæmorrhage. He would not obtain room enough for extracting the fœtus without extending the separation of the peritonæum to part of both iliac fossæ. The opening being in the middle line, he would not be able to facilitate its exit by tilting the uterus, as when it is made on the side. Finally, he would have a severe suppuration going on all around so sensitive an organ as the bladder. Probably Physick has doubted himself of the feasibility or value of this plan, since he never published it.

The last author of this period is Sir Charles Bell. In his "Institutes of Surgery," being a guide for students who attended his lectures, published in 1837,[1] after relating a Cæsarean operation in which he acted as assistant, he continues: "On such a case (one in which the mother cannot be saved by the operation of embryo-ulcia) recurring, time and opportunity being given for the performance of the operation, I would recommend the following precautions:

"1. That the incision through the abdominal wall should be made in a direction from the crest of the pubes obliquely outward. The epigastric artery would require to be tied.

"2. Press up the peritonæum—a matter not difficult in the pregnant state of the uterus—and reach the vagina or uterus under the peritonæum.

"3. Getting at the vagina, or certainly the lowest part of the uterus, make a small incision—introduce a finger—dilate

[1] American edition, Philadelphia, 1840, p. 341.

slowly, imitating in this the natural labor; there would be neither pain nor danger by delay.

"4. Break the membranes, and, if the action of the uterus should be as strong as I have seen it in the last case, permit the head to advance; if not, seize and deliver by the feet, as in the operation of turning.

"[Would not such a procedure avoid the breach of the peritonæum? Would it not avoid the fatal hæmorrhage which is consequent on the incision into the body of the uterus? Would it not give a better chance of recovery than an incision into the belly of the woman?]"

It is impossible to know if this idea originated entirely with Sir Charles himself, or if he knew anything about his predecessors. He says neither the one nor the other. It sounds as if the idea were his own. But, on the other hand, there were so many ways by which some knowledge of the subject might have reached him. Even apart from German works and Baudelocque's pamphlets, there are Velpeau's criticism in his "Traité de l'art des accouchements," 1829, translated into English by Meigs, 1831; Dubois's article in the celebrated "Dictionnaire de Médecine," 1834; and Dewees's "Compendium of Midwifery," 1830. All these publications were comparatively recent when Bell published his "Institutes." When we think of the easy intercourse between London and Paris, even in those days, he may have heard something about Baudelocque's plan and first operation. His silence on the subject would not contain any unfairness, when we remember that the work in which his plan is proposed is a brief memorandum for surgical students, and that Cæsarean section always has been a very rare operation in Great Britain.

However this may be, Bell announces at least one idea that is entirely new, and that an excellent one—I mean his advice to *make the incision in the vagina so small as just to admit the finger, and then use this for slow dilatation.* This shows that Bell, more than any of the other surgeons hitherto considered, understood the danger of cutting into these deep parts, rich in vessels and little accessible.

The result of this inquiry into the old history of gastro-elytrotomy is, then, that it has been *invented twice, or perhaps*

three times—by Ritgen, Baudelocque, and Charles Bell—*and performed once*—by Baudelocque—the patient dying from peritonitis, and the child having died before the operation.

Authors' Opinions.

The opinions expressed on the plans and the essays by authors form part of the history of the operation, and may guide others in the deliberations on the subject, although many of these remarks have lost much of their value, since the second period has been so remarkably successful. For clearness's sake I will divide the authors into two groups, those who upon the whole are in favor of the operation, and those who are against it.

Kilian,[1] in speaking of gastro-elytrotomy, called it "a method of decided importance, even if so far without any encouraging results."

Meygrier[2] says that "Baudelocque's process deserves the attention of practitioners."

Jacquemier[3] devotes many pages to the description of the different methods, and discusses the subject rather fully. He says that most of the objections put forth against the operation are founded on the consideration of the peritonæum in the non-pregnant woman, "but, if we," says he, "think of the changes occurring in consequence of the development of the uterus, we cannot forbear to accord more serious attention to it." The examination of the body of a woman who had died during labor convinced him of the feasibility of the operation. He advocates a longitudinal incision through the vagina and the neck of the womb, made in front of the vessels running on the lateral parts of these organs, and ends by the following judgment: "Doubtless the extensive separation of the peritonæum and the severed tissues would expose the patient much

[1] Kilian, "Operative Geburtshülfe, 2te Aufl., Bonn, 1849, vol. ii., p. 714.

[2] Meygrier, "Midwifery Illustrated." Translated from the French, with Notes, by Sidney Doane, New York, 1833.

[3] Jacquemier, "Traité des accouchements," Paris, 1846, vol. ii., p. 503, *seq.*

to diffuse suppurations of the subjacent areolar tissue, to peritonitis, to the inflammation of the veins and the lymphatics of the womb and the pelvis, to which the puerperal state particularly predisposes; but it cannot be denied that, in avoiding the incision of the peritonæum, and the entrance of blood from the cut vessels, and of the uterine secretions into its cavity, the woman would be preserved from the most common and the most active cause of death."

Horner,[1] after having described Physick's operation, adds: "It is evident that, if this be a practicable operation, it will diminish immensely the tendency to peritoneal inflammation, and will, in fact, put it on a foundation of danger very closely allied to the taking up the external iliac artery, near its origin, by taking aside the peritonæum."

Blundell, [2] after relating, though not quite accurately, Charles Bell's plan, says: "This dilatation is likely to prove of more easy accomplishment, because the substance of the uterus is, perhaps, naturally of a somewhat yielding and obsequious kind, and it is not altogether impossible that this method of procedure may be found desirable, not only in those cases in which the placenta chances to cohere to that part of the womb which corresponds with the abdominal incision, but in every instance in which the Cæsarean delivery is requisite. This proposal, however, requires consideration. Contusions and lacerations might, not without reason, be apprehended. By dilating in this manner we should diminish the extent of the uterine incision."

I have not been able to obtain Duchateau's remarks on Baudelocque's original plans; but, since they were published as an appendix to "*Nouveau moyen*," it is likely that he was in favor of the operation.

The unfavorable judgments are more numerous and more decided.

"*Revue médicale française et étrangère*," Paris, 1824, page 155, insists on the necessity of repeated trials on the cadaver on pregnant women, and demands the proof that the vagina

[1] Dewees's "Compendium," p. 599.

[2] James Blundell, "Principles and Practice of Obstetricy," by Thomas Castle, Washington, 1834, p. 355.

is sufficiently distensible, that no important vessels are injured, that the detachment of the peritonæum is not a greater injury than its incision in two places, that the injury of the peritonæum and the vagina is less dangerous than that of the womb; finally, that the rent in the vagina will not extend into the womb.

Velpeau,[1] after having stated Ritgen's procedure, somewhat inexactly, adds: "In the first place I cannot perceive how it would be possible to incise the apex of the womb without cutting the serous membrane with which it is enveloped; then the difficulties inherent in this proceeding, added to the detachment which would be produced in the iliac fossa, do not appear to me to be of a nature to render the operation at all less serious than those which have been mentioned" (other methods for Cæsarean section). Of Baudelocque's plan he says that he "can scarcely believe that it will be found practicable in a majority of cases, or that the laceration of the vagina, in addition to the disturbance necessarily occasioned in the iliac fossa or in the excavation, would be less redoubtable than the simple and methodical incision of the peritonæum and womb, such as may be performed in ordinary hysterotomy." As for Physick's suggestion, he finds that it is "little worthy of its inventor, and does not deserve the trouble of being discussed."

The great Paul Dubois, who so long time governed French obstetrics as an autocrat, treats the subject in an addition made to Desormeaux's article on Cæsarean section, in the "*Dictionnaire de Médecine ou Répertoire Général des Sciences Médicales*," 2d edition, Paris, 1834, vol. vii. He thinks that the new methods of Ritgen, Baudelocque, and Physick, "without offering any advantage, present difficulties and dangers from which the other methods of Cæsarean operation are exempt." He censures especially the place of the incision in a part of very small dimensions and of difficult access, so rich in vessels and possessing so little retractility that a serious hæmorrhage is almost certain to supervene.

[1] Velpeau, "Elementary Treatise of Midwifery." Translated by Meigs. Philadelphia, 1831, p. 514.

Cazeau,[1] one of the most esteemed of modern obstetricians, says: "If the incision in the peritonæum could be avoided, effusions of blood or of sanious or purulent matter into its cavity would not take place, and the patient be protected from the most efficient cause of death. This advantage is unfortunately so fully balanced by the difficulties of the operation, by the number of vessels wounded, and by the inflammation liable to follow the extensive separation of the peritonæum, that the method is now *entirely abandoned*."

Moreau[2] insists likewise on the dangerous inflammations that are likely to follow the detachment of the peritonæum, and asks who will guarantee that this membrane, after having been raised, is not torn during the passage of the child? Nay, he goes so far as to question the possibility of carrying this method out in practice.

Bedford[3] mentions Joerg, Ritgen, and Baudelocque, and gives an exact description of the latter's plan as modified in his third method, and finishes by declaring that to him this operation is "the very reverse of plausible."

Tarnier,[4] like Moreau, questions the feasibility of the operation, repeats the criticisms of his predecessors, and declares it to be still more redoubtable than gastro-hysterotomy, wherefore it "has been *completely abandoned*."

In the "Nouveau dictionnaire de médecine," edited by Jaccoud and other celebrities, in Paris, 1867, vol. vi., p. 697, J. A. Stoltz gives an incomplete summary of Ritgen's, Baudelocque's, and Physick's contributions, which he stamps as eccentricities. According to him it was easy to foresee that there would not be room enough for extracting the child, and that the incision of the vagina and lower segments of the uterus would meet with insurmountable difficulties.

[1] Cazeau, "Theoretical and Practical Treatise of Midwifery," fifth American, from seventh French edition, by William R. Bullock. Philadelphia, 1873, p. 1038.

[2] Moreau, "Traité des accouchements," Paris, 1841, vol. ii., p. 356.

[3] Bedford, "The Principles and Practice of Obstetrics," New York, 1861, p. 640, foot-note.

[4] Lenoir, Sée et Tarnier, "Atlas complémentaire de tous les traités d'accouchements," Paris, 1865, p. 276; quoted by Masson: "De la Gastro-élytrotomie." Thèse pour le Doctorat, Argenteuil, 1878, p. 29.

Naegele-Grenser[1] states briefly what had been proposed or essayed by Joerg, Ritgen, Physick, and Baudelocque, and holds it to be superfluous to go into detail about the dangers and difficulties attending gastro-elytrotomy.

I am not prepared to say that this is all that has been written on gastro-elytrotomy in its first period, but it is all I have found while searching in all the works on obstetrics I have been able to lay hands on in public and private libraries. The great majority do not mention the operation at all; most of those that do so, condemn it; a few only are timid defenders. It had been entirely abandoned and almost forgotten. No practical obstetrician had ever thought of it for a generation, even when grappling with the most desperate case. Thus stood things when Dr. Thomas, unacquainted with its existence, invented it again in an improved form, and inaugurated the second period of its history.

Second Period. *Fulfillment.*—It is a curious fact that, half a century after Ritgen's operation, the little town of Yonkers, on the border of the Hudson River, should be the first place in which the word gastro-elytrotomy sounded again after the long interval elapsed since the operation had been tried for the last time. In 1870 Dr. T. G. Thomas read before the Medical Association of that place a paper entitled: "Gastro-Elytrotomy, a Substitute for the Cæsarean Section."[2] He had then twice essayed it on the cadavers of non-pregnant women, and once (February, 1870) on that of one in the latter part of the ninth month of pregnancy, and had performed one operation on the living subject, which he reported in these terms:

Case I. "*Gastro-elytrotomy performed on a living woman. A living child delivered.*—Within a month from the time of the experimental operation just recorded, I was called in great haste by Dr. T. C. Finnell to a case which he was attending with Dr. Richardson, under the following circumstances. The patient, a multipara aged about forty years, and at the end of the seventh month of utero-gestation, had been suffering from pneu-

[1] Naegele's "Lehrbuch der Geburtshülfe," 7te Auflage, bearbeitet von Grenser, Mainz, 1869, p. 411.

[2] *American Journal of Obstetrics*, vol. iii., No. 1, May, 1870.

monia for a week or ten days, and was now *in articulo mortis*. Dr. Finnell intimated to me that he could wait only a short time for me, for, as the woman was fast becoming comatose, he deemed it his duty to perform the Cæsarean section in the interest of the child, which might prove viable. I hastened to the patient's house, and found everything in accordance with what has been stated above: the patient, almost entirely pulseless, was cyanosed, breathing with a loud laryngeal rattle, and almost entirely unconscious. A rapid consultation was held between Drs. Finnell, Richardson, Jas. L. Brown, Walker, Lynch, and myself, and it was decided that the child should be at once removed by abdominal section.

"The patient being placed upon a table, anæsthesia was produced, so as to quiet her restlessness and jactitation, with a few inhalations of ether. I then passed my hand up the vagina and dilated the cervix slowly and cautiously, so that at a three-quarter distention no injury was done to its tissue. With a bistoury I then cut through the abdominal muscles, the incision being carried from the spine of the pubis to the anterior superior spinous process of the ilium. The lips of the wound were now separated, and by two fingers the peritonæum was lifted with great readiness, so that the vagino-uterine junction was reached. The vagina was now lifted by a steel sound passed within it, and cut, and the opening thus made was enlarged by the fingers. The cervix was then lifted into the right iliac fossa by the blunt hook, while the fundus was depressed in an opposite direction. I then passed my right hand into the iliac fossa and introduced two fingers into the uterus, while the left hand, placed on the outer surface of the uterus, depressed the pelvic extremity of the fœtal ovoid. The knee was readily seized, and delivery easily and rapidly accomplished. The child was born alive, but was a badly-developed, harelipped, and, as I before stated, premature infant. It lived about one hour, during which time the rite of baptism was administered to it. The mother, the wound in whose abdomen was closed by interrupted suture, died about the same time as the child.

"In completing the recital of this case, I need hardly point out the fact that the fatal issue for mother and child which occurred should not in the slightest degree be imputed to any inherent imperfection of the operation itself. It was unquestionably due to these two circumstances which characterized this individual case: first, that the woman was moribund when the operation was undertaken; and second, that the child was premature, undeveloped, and probably depreciated in strength by the toxæmia which had for days affected its mother in consequence of pneumonia. I think that I am correct in saying that al the gentlemen present agree in the belief that nothing connected with its delivery could in any way have injured the child's prospects for life. The liquor amnii was unevacuated up to the moment when version was practised, and not an instant's delay, or the expend ture of any, even the slightest, force was developed as a possible cause of death. The child died, as we so often see premature children

die, of want of cerebro-spinal and ganglionic nerve-power to maintain the functions of life in its new relations."

Five years later Dr. Thomas incidentally spoke of this operation in the New York Obstetrical Society,[1] and, in speaking from memory of a thing done at so remote a date, quite naturally committed some small mistakes, of which only one merits mention. He said that he enlarged the opening in the vagina with the *scissors*, while in the original paper it reads "with the *fingers*," and, as we shall presently see, this is a point of great importance, as it contains the clew to Dr. Thomas's success.

Eight years after this operation, Dr. Thomas performed another:

Case II.[2] "*Laparo-elytrotomy successfully performed for both mother and child.*—On the 3d of December, 1877, I was requested by Prof. James W. McLane to see with him, at the Nursery and Child's Hospital, a woman who had been taken in labor some sixteen hours before. She resided in Harlem, about four miles distant, and had been attended there by Drs. Farrington, Dwyer, and Shrady, who, finding the pelvis so much contracted as to require an operation, had sent for Dr. McLane, and at his suggestion she was brought to New York. The labor at this time was far advanced, but her surroundings at home were so unfavorable that this was deemed the wiser course.

"The woman was Irish, twenty years old, married, and a primipara. She was very small and undeveloped; one leg was contracted and bent, and the thigh firmly flexed on the abdomen. The pelvis at the superior strait had been estimated by Dr. McLane, Dr. G. A. Sabine, and the other gentlemen above mentioned, at 2¾ inches in the conjugate diameter, though I question whether it measured more than 2½. At the outlet, the conjugate diameter was long, while the transverse was estimated at 2¼ inches.

"The question as to operative procedure, up to the time of my arrival, had been between evisceration, the child presenting by the breech, and Cæsarean section, the preponderance of opinion being decidedly in favor of the former. I proposed, as a compromise, laparo-elytrotomy, and, this being decided upon, Dr. McLane very kindly requested me to perform the operation.

"The patient being anæsthetized and laid upon a table, I cut through skin and adipose tissue from the superior spinous process of the ilium,

[1] *American Journal of Obstetrics*, vol. viii., p. 326, August, 1875.

[2] Ibid., vol. xi., p. 240, April, 1878.

along the upper edge of Poupart's ligament to the spine of the pubis on the right side of the body. Then I cut through the muscles, and, coming down to the peritonæum, lifted this, and touched the vagina. Dr. McLane now passing his finger through this canal and pushing it upward, I cut down upon it near the uterine junction. Then inserting my two index-fingers, I tore the vaginal wall downward. Immediately the uterus, contracting strongly, forced the breech of the child into the iliac fossa, and, hooking the index-fingers into the groins, I rapidly delivered. The child was asphyxiated, but by sharp slapping it soon recovered and cried lustily. From this time onward it did perfectly well.

"The wound having been thoroughly cleansed of blood-clots by forcing carbolized water through it by means of a Davidson's syringe, was closed by silver sutures throughout. No vessels were tied, and thus no foreign substance was left within it.

"The duration of the operation, from the time of the first incision to its completion, was thirty-five minutes. After its completion, the patient was put to bed, given an opiate, confined to fluid diet, and kept perfectly quiet upon the back.

"From this time the history is compiled from Dr. Beckwith's notes.

"*December 4th.*—Patient slept well last night, quieted by morphia administered hypodermically. At 8 A. M., temperature 99°, pulse 132. Milk given every two hours. 7 P. M., temperature 102°, pulse 140.

"*5th.*—8 A. M., temperature 99⅘°, pulse 124; 7 P .M., temperature 100°, pulse 128.

"Urine does not pass through catheter kept in bladder, but escapes *per vaginam*. A fistula evidently exists.

"*6th.*—9 A. M., temperature 101°, pulse 136. Wound washed out by vaginal injection of carbolized water every eight hours; water forced out through abdominal wall freely. 10 P. M., temperature 101⅘°, pulse 128.

"*7th.*—8 A. M., temperature 102⅘°, pulse 128; 7 P. M., temperature 98⅘°, pulse 116.

"*8th* (sixth day since operation).—8 A. M., temperature 98⅘°, pulse 108. Urine flowing now freely through catheter. When vagina is injected, very little water flows through wound. 11 P. M., temperature 100⅘°, pulse 116.

"*9th.*—8 A. M., temperature 98⅘°, pulse 124; 8.30 P. M., temperature 101°, pulse 124.

"*10th.*—8 A. M., temperature 99⅘°, pulse not recorded; 9 P. M., temperature 98⅘°, pulse not recorded.

"*11th.*—9 A. M., temperature 103°, and at 10 A. M., 104⅘°. As patient had lived in a very malarious district, rise of temperature was regarded as due to miasmatic poisoning. Quinine was given in scruple dose, and at 7 P. M. temperature was 100°.

"*12th.*—9 A. M., temperature 101½°, pulse 124; 8 P. M., temperature 103½°, pulse 128.

"*13th.*—8 A. M., temperature 101⅘°, pulse 112; 8 P. M., temperature 98⅘°.

"*14th.*—8.30 A. M., temperature 98⅘°, pulse 92; 7.30 P. M., temperature 98⅘°, pulse 88.

"Patient very steadily and certainly improving. December 15th, temperature taken every two hours, 98⅘°, pulse from 92 to 104.

"From this time the patient went on steadily to complete recovery, the wound healing by second intention, the solution of continuity being filled up by granulations.

"It is in my mind a question whether the rise of temperature was due to miasmatic poisoning, or to septicæmia. My impression is that the former condition produced it, as it was markedly controlled by quinine, freely administered.

"On the 20th day after the operation, the bladder, which was undoubtedly injured by the operation, recovered its retentive power, the catheter was removed, and patient thenceforth passed her urine voluntarily.

"On the 25th day after the operation, one end of the round ligament protruded from the wound, which had now nearly healed throughout its length. This was ligated and cut off.

"On January 3d, thirty-two days after operation, the wound, which was originally five inches long, measured in length two and a half inches, and in depth half an inch. Vaginal examination showed on right side an opening with sharp, falciform border extending into iliac fossa, one inch in extent.

"On this date the patient was discharged cured. She and her child have since done perfectly well."

Dr. Thomas, in the paper read before the New York Academy of Medicine, on the 21st of March, 1878, from which the last-mentioned case is taken, declares[1] that, until some time after he had essayed it on the cadaver, he was fully under the impression that the idea had originated with himself, and, although he spoke of it freely with his professional friends in New York, none of them were able to correct his error until he mentioned it to Dr. Emil Noeggerath, who remembered having somewhere read of Ritgen's operation. After having seen, in the preceding chapter, how entirely the idea had been abandoned, nay, forgotten, this is easily understood by any one who is acquainted with the peculiarities incidental to life in this metropolis, that, in fact, contains two millions of inhabitants, widespread over different islands and part of the continent, and who knows what claims are

[1] *L. c.*, p. 230.

laid on the time of a man of such a skill and such a fame as Dr. Thomas. Already, in his first publication on the subject, he gave such historical data about previous attempts as he had been able to obtain from Kilian's, Dewees's, and Velpeau's works.

I think it is fortunate that Dr. Thomas was unacquainted with the difficulties encountered by his predecessors. Had he known the unsuccessful operations of Ritgen and Baudelocque, it is very likely that he never would have tried a plan that, in their hands, had proved so utterly a failure. As it is, prompted by his genius alone, he went to work and tried the idea originated in himself, and a splendid success put him in a place in vain aspired to by others. And *why did he succeed?* His operation is identically the same as that essayed fifty years before by Ritgen, except in this respect, that he did not *cut* backward in the vagina, but *tore* the vaginal wall as soon as he had made an incision large enough to admit his two index-fingers. This is by far the safer process, for by being torn the blood-vessels of the vagina are much less likely to bleed. Spontaneous ruptures of the vagina seldom give rise to dangerous hæmorrhage. They may nevertheless do so exceptionally, and we have seen that Baudelocque met with a hæmorrhage the moment he thrust his bistoury into the vaginal wall. Although in his case it does not seem to have warranted him in desisting from the operation, a troublesome hæmorrhage may occur, and it is therefore better to make the first incision bloodless by using the cautery, as suggested above.

As my chief motive for composing this dissertation is to enable the reader to form a clear opinion of gastro-elytrotomy, by comparing the old operations with the recent ones, and thereby to contribute to dispel the dread with which it has been surrounded by the damaging verdict pronounced against it by great authorities, I think it useful to make such additions to the description given by Dr. Thomas as I am enabled to by his own kindness, in answering certain questions put by me, and as he has authorized me to publish. He did not extend his incision precisely up to the spine of the pubis, by doing which he would have cut the epigastric artery. He made it

at some little distance, say an inch, above Poupart's ligament, and did not extend it to the mesial line, exactly as recommended by Baudelocque, who places the inner angle of the abdominal wound at one inch and three-quarters above and outside of the spine of the pubis. Dr. Thomas did neither see nor cut the epigastric artery. As for the superficial artery, of the same name, which necessarily is cut, he merely applied temporary compression to it by a holding-forceps. The first incision in the vagina was made at some distance below the neck of the uterus, perhaps an inch or an inch and a half. This point is of importance, since an opening immediately below the os would injure the ureter. He made the incision just large enough to get through, and then he tore with his index-fingers, one turned toward the os uteri, the other toward the descending ramus of the pubis. Thus he aimed at making a longitudinal rent. He cannot state what shape it took, but he feels certain that it becomes stellate when the child passes. Else he does not think it would be possible to get it through. He tore only enough to insert the tip of his fingers, put together as for dilating the os. While the hand passes the fissure tears more, and finally, during the passage of the child, it tears still more. It is of course impossible to tell what direction the branches of the rent will take; this is the hazardous part of the operation, but the result so far shows that the risk is much smaller than in Cæsarean section. He neither saw nor felt the iliac vessels. In his first operation he removed the placenta *per vias naturales;* in the second, through the abdominal wound.

To Dr. Thomas, then, belongs the glory of having been the first who performed gastro-elytrotomy so as to extract a living child from a living mother in his first operation, and of having brought both mother and child to complete recovery in his second operation. In both cases the operation was perfectly indicated, the alternative being in the first Cæsarean operation, on account of the mother's moribund state, and her physician's unwillingness to let her die undelivered; in the other, either Cæsarean section or an embryotomy that would have been extremely difficult and dangerous to the mother, on account of the breech presentation, combined with considerable coarc-

tation of the pelvis, and which, besides, would have cost the child's life.

The last, but by no means the least important, performer of gastro-elytrotomy we have to deal with is Dr. Skene. Between Dr. Thomas's two cases, he has performed the operation no less than three times with the greatest success:

Case I.[1] *Gastro-elytrotomy, performed in the interest of the mother after perforation of the head of the child.*—"Dr. Charles Corey was called to see the patient on Saturday morning, March 21, 1874. He then learned that she was a primipara at full time. Her general health had been fair for years; she was rachitic when a child, and did not walk until she was over five years of age. Labor began on the night of Friday, the twentieth. The os uteri was dilated, but the head, the presenting part, was wholly above the superior strait.

"When the os became fully dilated, the doctor ruptured the membranes, but the head did not at all engage in the pelvic cavity. Drs. Andrews and Fürgang were called in consultation, and it was decided to try version.

"At three o'clock on Sunday morning the operation was tried, but was found to be impossible, owing to the shortness of the antero-posterior diameter of the pelvis, which was not more than two and a half inches in diameter. At eight A. M., of the same day, delivery by craniotomy was undertaken, but, after perforating the head, that also was abandoned because of the œdema of the parts and the narrowness of the pelvis. I saw the patient in consultation with the gentlemen named, at two P. M., on Sunday, about forty-eight hours from the time when she was taken in labor. Gastro-elytrotomy was proposed and agreed to by all the gentlemen present, as the only means of giving the patient a chance for her life. It was also believed that if she died—which in all probability she would—she would be relieved from the severe labor-pains which still continued. At this time she was suffering from exhaustion. Her pulse was rather feeble and over one hundred and thirty. She was anæsthetized, and I operated with the assistance of the gentlemen in attendance, and Dr. George Cushing. The general rules laid down by Prof. Thomas were followed, and I can testify to the truth of his statement that the operation is exceedingly simple, and may be performed with rapidity and certainty, for, although the operation was unknown to me in every sense, except the description of it which I had read, I was able to make the dissections and deliver the child and placenta in ten minutes, and without making any haste. The patient came out from the anæsthetic very well, and remained free from pain afterward. The exhaustion and shock were but slightly increased by the operation, but they gradually became more marked, and she died seven hours after the operation.

[1] New York Medical Journal, 1874, vol. xx., p. 401.

"There are several observations which I made during the operation, which are of sufficient importance to be worthy of special mention. The incision through the skin and superficial fascia was made from the spine of the pubis to the anterior superior spinous process of the ilium, as directed by Prof. Thomas. This I found to be longer than necessary. The muscles were then divided a little more than two-thirds of that distance. The opening made appeared to be rather small, but I found that it stretched with the greatest facility, and was therefore ample.

"The finger was used to raise up the vagina at the point where it was opened. I believe that this method is preferable to using the sound, as directed by Prof. Thomas. I was able in this way to avoid a large vessel which I felt pulsating. The finger was also used in place of the blunt hook to draw the cervix up to the right iliac fossa, while the fundus was carried to the left side.

"In place of delivering the child by version, as recommended by Prof. Thomas, I seized the occipital bone with the craniotomy forceps, and extracted the child with the greatest ease. At the same time I had the ordinary obstetric forceps at hand, and satisfied myself that I could have applied them to the head and delivered with more facility than I could by performing version.

"The experience afforded by this one case has fully convinced me that the operation should take the place of Cæsarean section, and in deformity of the superior strait it should be tried in place of craniotomy when the life of the child could be saved by doing so."

Case II.[1] *Gastro-elytrotomy performed successfully for mother and child.*—"Mrs. F., aged 31 years, born in England. She is rachitic, and, in giving her history, stated that she was unable to walk without support until eleven years of age. At twenty-five years of age her physician delivered her by performing craniotomy, after which she made a slow recovery, and was confined to her bed for six weeks. Some time after that she was delivered at the seventh month. The child lived only a few minutes. When she came to this country her physician gave her a letter stating the nature of her former confinements, and also that she had a deformed pelvis. This letter she brought to me in 1872, when I found that she was again pregnant. She expressed a strong desire to have a living child, and, upon examining the pelvis, I resolved to let her go until the beginning of the ninth month, when I proposed to induce labor, in the hope of obtaining a living child. Accordingly I brought on labor in the first week of the ninth month, and found an arm presentation. Version was performed with great difficulty, owing to the fact that the antero-posterior diameter of the superior strait was not more than two and three-quarters (2¾) inches.

"By using strong traction, and extreme pressure over the uterus, depression of one of the parietal bones was produced, and thereby a small child

[1] *American Journal of Obstetrics*, February, 1876, vol. viii.

was delivered, which lived for several months. Metritis followed, and she suffered great pain in her back and limbs. There was also partial paralysis of the limbs, which slowly disappeared. Altogether it was five weeks before she recovered. At that time she was strongly advised to give up child-bearing. Some time ago she called upon me and stated that she was pregnant, and urged me to save her child if possible. I told her, if she would take the risk, I would give her what I believed to be the only certain chance of having a child, and also the possibility of saving her own life. She cheerfully accepted the proposition, and expressed her determination to go to full time.

"I gave the history of her case to Prof. T. G. Thomas and asked his advice and assistance. His kind reply was that he would be at my service at any time. Late in the afternoon of October 28, 1875, she called at my office, and, on examination, I found her at full time, the os uteri dilatable, and that she had slight uterine contractions.

"She was ordered to go home and to let me hear from her late in the evening. At ten o'clock her husband reported that she had slight pains, but was about the house and felt comfortable. I gave directions to call me during the night if her pains increased, and not to wait longer than four o'clock in the morning. Labor progressed, but, being unwilling to disturb me, they did not call me until six A. M. on the 29th. I then found that she had good labor pains, and that the os uteri was almost fully dilated; the membranes were unruptured, and an arm and the cord were presenting. I could feel the cord pulsating through the membranes, and the fetal heart was heard distinctly. I sent in all haste for Prof. Thomas, but most unfortunately he was engaged and could not come. I also sent for Drs. Corey, Cushing, and Stuart. While waiting for my medical friends, I was in constant dread that the membranes would rupture and the cord become compressed so as to destroy the child.

"I felt sure that I could not restore the cord and keep it in place when there was an arm presentation, and I dreaded the death of the child, which would have decided in favor of delivery by embryotomy, an operation which, under the circumstances, would have been difficult and very dangerous to the mother. Fortunately the membranes remained intact until my friends came. At nine o'clock, I performed gastro-elytrotomy, according to the method of Prof. Thomas, the best, indeed the only, authority on this operation. I opened the abdominal wall and also the vagina, before I ruptured the membranes. I then delivered by performing version.

"Having reason to believe, from the character of the fetal heart action, that the circulation of the child was slowly becoming interrupted, I made great haste to deliver as soon as I ruptured the membranes.

"The child, which weighed ten pounds, was slightly asphyxiated, but was easily restored.

"The time occupied, from the beginning of the operation until the child and placenta were delivered, was fifteen minutes, five minutes longer than my former operation. The extra time required was owing to slight

hæmorrhage, caused by making the incision in the abdominal wall lower down than was necessary, and also by having to restore the prolapsed arm, and deliver by version.

"There was no shock or vomiting after the operation, and no hæmorrhage, primary or secondary, worthy of notice.

"Several hours after the operation, Dr. Stuart, in passing the catheter, discovered that the bladder had been opened. The opening in the vagina had been extended so as to enter the junction of the urethra and bladder, on the right side.

"I am satisfied that the bladder was not wounded at the time when I opened the vagina, but that it occurred during delivery.

"If I had had more time, and could have permitted the parts to distend gradually, the wound in the bladder would not have been made. It was unfortunate, if not bad management on my part, that I did not detect the wound in the bladder at the time of the operation, for then a few stitches could have been easily introduced and the catheter worn until the opening closed.

"When I became aware of the accident, I was unwilling to anæsthetize my patient again and submit her to the operation of closing the wound, because I feared that I might cause hæmorrhage.

"The second day the temperature went up, and she became quite tympanitic, but there was no tenderness to indicate peritonitis.

"The symptoms were due mostly, I believe, to a slight metritis, such as she had after her other confinements. These conditions continued for about four days, but the temperature did not at any time exceed 102°, and the pulse did not go beyond 120. On the sixth day, the tympanitis was relieved by an injection containing mint-water.

"Morphine was given at night to secure sleep, and quinine was used in the day in the hope of preventing malarial fever, which had troubled her, off and on, for years. From the sixth to the tenth day her condition was remarkably good. Her pulse and temperature were normal, her appetite good, and she had a scanty secretion of milk.

"On the tenth day she sat up in bed, contrary to our expressed wishes, but was apparently no worse for it.

"In the afternoon of the eleventh day she had a chill, followed by fever and free perspiration. She was quite well on the morning of the twelfth day, but the chill and fever were repeated in the afternoon.

"Quinine was freely given on the following day, and there has been no return of chills or fever. She believes that this part of her trouble was a return of her familiar ague, and I believe that her diagnosis was correct.

"The external wound healed by first intention, except at the two central stitches, where there was suppuration. Both the abdominal and vaginal wounds were completely healed on the fourteenth day. On the fifteenth day she sat up in a chair while her bed was being made, and, with the exception of the opening in the bladder, she was as well as one of her constitution could be at that date after confinement. At the end of three weeks

she went out riding, and continued in good health from that time. On November 28th, I closed the small vesico-vaginal fistula, and two weeks afterward dismissed her well and sound. January 15, 1876, she is well, and nurses her strong, healthy baby.

"Finally, I wish to state positively that I believe the injury done to the bladder was the fault of the *operator*, not of the *operation*, and that I could avoid that accident in future. I am also satisfied that I could not have, under the circumstances, delivered that patient in any other way, with more *safety* to *herself*. I trust that the history of this case (the first successful one on record) will aid in placing the operation among the chief triumphs of obstetrical surgery, to the honor of Professor Thomas, whom I believe to be its author."

Case III.[1] *Gastro-elytrotomy performed successfully for mother and child, four days after beginning of labor. Lordosis. Anchylosis of both hip-joints. Previous pelvic peritonitis.*—"The subject of this history is an unmarried Bohemian girl, thirty-seven years of age. She became pregnant, but concealed her condition from her relatives, with whom she lived, up to the full period of gestation. This she was enabled to do by being herself very much deformed in body.

"She was taken in labor on Tuesday, the 19th of June, 1877, and soon after the membranes ruptured; at least, this much was learned from subsequent inquiry. Her labor pains continued, but she did not disclose her true condition, nor did her friends suspect what was her trouble; but, becoming alarmed at her continued sufferings, they sent for Dr. S. Schmitzer on the morning of Friday, the 22d. The doctor found that she was pregnant at full term. The membranes were ruptured, the liquor amnii completely drained off, and the uterus contracted firmly round the child. The dilatation of the os uteri was only sufficient to admit the point of the finger.

"The patient was much below the average size, emaciated, her complexion sallow, and her skin dry and ill-conditioned in appearance. There was a well-marked forward curvature of the spine in the lumbar region; the sacrum was nearly straight, and formed a right angle with the axis of the spinal column; the symphysis pubis was deeper than normal, being about two inches. The antero-posterior diameter of the superior strait was said by Dr. Schmitzer to be one and one-fourth inch, and I am confident that it did not exceed one and one-half inch. The thighs were flexed to nearly a right angle to the body, and held there by anchylosis of the hip-joints. The knees could not be separated more than an inch and a half. The left lower extremity was four and three-fourths inches shorter than the right. A number of deep scars about the hips indicated the previous existence of large abscesses. These, ex-

[1] *American Journal of Obstetrics*, vol. x., p. 623, October, 1877. With two woodcuts after photographs.

isting in connection with the anchylosis, led to the conclusion that she formerly had had the hip-joint disease on both sides.

"Dr. Schmitzer, finding the conditions described, satisfied himself that normal delivery was impossible. He then called Drs. Frickenstein and Weber to see her in consultation. These gentlemen agreed with the doctor regarding the deformity and the difficulties in the way of delivery.

"I saw the patient with Drs. Schmitzer and Alexander Hutchins at six P. M., on Friday, the 22d. She was then partially relieved from pain by a dose of morphine, which was given to her in the afternoon. The os uteri was still undilated beyond about half an inch. From the character of the presenting portion, as observed through the walls of the uterus, it was presumed to be the vertex.

"In consultation we agreed to first dilate the cervix, and then deliver by gastro-elytrotomy; but, as the patient was not having severe pains, and we were not then prepared to operate, we concluded to wait until morning, when we would have daylight. In the mean time dilatation of the os could be attended to. Early on the following morning, Saturday, Drs. Schmitzer and Hutchins began an artificial dilatation of the os, which was found to be a most difficult task. Owing to the deformity of the patient, the cervix was flexed backward so as to bring its axis to a sharp angle with the axis of the uterus, and there was not room enough in the pelvic cavity to permit bringing the cervix forward on a line with the body of the uterus. It was therefore almost impossible to pass the dilator through the internal os. After prolonged manipulation, dilatation to the extent of two and one-half inches was effected.

"At ten A. M., on Saturday, the 23d, four days from the time labor began, we were prepared to operate. In selecting this method of operating, we were guided by the fact that craniotomy was impossible under the circumstances, not alone because of the narrow superior strait, but also from the fact that the axes of the uterus and vagina were at right angles, which made it impossible to use the necessary instruments for delivery in that way. This statement will be indorsed by Drs. Schmitzer and Hutchins, who tried to dilate the cervix. Cæsarean section was suggested by the difficulties in the way of gastro-elytrotomy; but we preferred to encounter the obstacles rather than open into the peritoneal cavity and uterus of the patient. The condition of the patient just before the operation was not encouraging. Her skin was dry and hot, tongue coated, temperature 102½°, pulse 98. Indeed, the operation was beset with difficulties from beginning to end, and on that account I will give the several steps in brief detail.

"To reach the point for incision parallel to and a little above Poupart's ligament, it was necessary to raise up the abdomen and retract the soft parts of the thigh as much as possible. The parts being thus brought into view, the abdominal walls were divided through the tegumentary and muscular layers. This was accomplished without much trouble; but, on reaching the region of the peritonæum, I encountered the products of a

previous inflammation, which obscured all the normal anatomy. I have always believed that a previous pelvic peritonitis would greatly complicate this operation, and have dreaded that such a case might fall to my lot, and in this case I fully realized my expectations. The peritonæum, iliac fascia, bladder, and vagina were all glued together by plastic material, which rendered the normal tissues unrecognizable. This, and the space between the flexed thigh and the large abdomen being very narrow, made the difficulty of manipulating very great. The vagina also was narrow and unyielding, so that it could not be forced upward to guide us in the right direction. In this part of the operation there were three points of danger to be guarded against:

"*First.*—Wounding the peritonæum. There is no danger of doing this when the parts are normal, for then the peritonæum can be easily recognized and lifted up from the other tissues with perfect facility; but in this case everything was changed in appearance and character, and in place of easy-sliding tissues we had lymph and adhesions, both difficult to manage.

"*Second.*—I had learned, by former experience, that to open the vagina too near the symphysis pubis gives rise to the danger of the incision extending into the bladder during delivery.

"And *Third*, if the incision is made too near to the walls of the abdomen, there is danger of wounding the circumflexa iliac artery.

"We succeeded in avoiding the peritonæum and important vessels, but unfortunately the bladder, which was drawn upward and to the right by old adhesions, was wounded. That is not very surprising when it is remembered that in making this portion of the dissection I was guided mostly by the sense of touch, and the parts were so crowded together and changed in appearance as to be almost unmanageable. The point at which the bladder was wounded was just opposite the anterior superior spinous process of the ilium, a place where one would not expect to find it.

"When the cervix uteri was reached through the opening in the abdominal wall and vagina, we found dilatation sufficient to admit the points of the four fingers. Manual dilatation was then made and soon completed. The only difficulty experienced was in getting the fingers between the child's head and the uterus, so firmly was the latter contracted. The head presented transversely, with the occiput to the left side. Delivery by version has been advised in this operation, and was thought of in this case, but was ruled out as being impossible, owing to the firm contraction of the uterus. Deciding to deliver with the forceps, we proceeded to use them. Here we encountered another perplexing difficulty. The thigh stood up in front of the opening in the abdominal wall and the os uteri, and prevented the introduction of the instruments. After some awkward manipulating, we succeeded in grasping the head, and then delivery was easy and speedy. The placenta came away without trouble. There was very little hæmorrhage; the wound was closed with silver sutures and dressed with cotton wadding, secured by adhesive straps.

"The child was markedly asphyxiated, due, no doubt, to the continued

contraction of the uterus so long after the escape of the liquor amnii. It was restored after the vigorous employment of artificial respiration. It was well developed, healthy in appearance, and weighed 7½ pounds. Drs. S. Schmitzer, Hutchins, Corey, Cushing, and Hunt were present and gave their counsel and assistance in the operation.

"She recovered from the anæsthetic promptly, and showed no symptoms of shock, nor did she complain of pain or discomfort. On the day following the operation her pulse was 94, and her temperature had fallen from 102½° (which it was at the time she was delivered) to 100°. The catheter was used frequently in order to keep the bladder from being fully distended.

"Drs. Schmitzer and Hutchins observed that, after a few days, the quantity of urine retained in the bladder became less and less, and at the same time the urine was seen to escape from the vagina.

"The introitus vaginæ was small and firmly contracted, which prevented free drainage, causing the urine to accumulate in the vagina and well up through the abdominal wound.

"A rubber tube, perforated with small holes for about two inches at one end, was introduced into the vagina for the purpose of draining off the urine. It answered well, and for twenty-four hours the urine flowed continuously and freely into a urinal, and all appeared to progress well for a time. The patient, unfortunately, was ignorant, obstinate, and unmanageable. Her mental obliquities and angularities were, like those of her body, well marked. After a day or two she became dissatisfied with the drainage-tube and would not let it remain any longer in the vagina. Every time that the doctor placed it there, she would withdraw it and throw it away, and no argument could persuade her to do otherwise. The urine, from this time, flowed freely from the abdominal wound, and occasionally from the vagina. Owing to the disagreeable disposition of the patient, it was impossible to keep her clean or comfortable. Her appetite was good, her bowels moved regularly, she slept well on small doses of morphine at bedtime, and her pulse and temperature were normal, but it was difficult to keep her wounds in good condition. She was cared for by her sister, who, although willing, was not skilled as a nurse, and, besides, she had her household duties to perform.

"Such being her surroundings, we concluded to send her to the hospital, and on the fifth of July, two weeks after delivery, she was taken there. She made the journey to the hospital, about three miles, very comfortably. When admitted, her condition gave evidence of want of proper nursing. The wound was healed except at the outer portion near the anterior superior spinous process of the ilium, where the fistulous opening was. Around the opening the parts were foul and covered with a superficial slough. Most of the urine escaped from this opening. There was also a free purulent discharge.

"She was placed upon tonic doses of quinine, and a little morphine at bed-time to relieve an uneasy restlessness. The wound, vagina, and blad-

der were kept thoroughly clean by the frequent use of carbolic acid and water. A stream was passed from the wound in the side through the vagina and then reversed. The bladder was also injected; the stream being carried in through the urethra and made to escape through the vagina and abdominal opening.

"To keep the wound in the best condition for healing, a rubber tube was introduced into the fistulous opening in the side, and it made good drainage when the patient could be persuaded to keep it in place, but she often pulled it out. After a few days the house physician succeeded in passing a perforated rubber tube from the abdominal opening out through the vagina and left it there. This made perfect drainage. Sometimes the urine would flow from one end of the tube, and sometimes from the other, according to the position taken by the patient, and she was unable to remove this tube, which was a great advantage.

"From this time the abdominal wound healed rapidly, and the drainage-tube was finally removed about the third of August. The urine flowed then from the vagina only. To drain the vagina, a hard-rubber bulb with a stem was used, which answered very well to carry off the water. The bulb was olive-shaped, and perforated closely with small holes. To the stem of the bulb a small flexible tube was attached which conveyed the urine to a vessel. A rubber urinal was obtained for her which she could wear while walking around, but for some reason, which no one could understand, she would not use it.

"Most of the time since the operation the bladder has retained more or less urine, and at this stage of her progress the house physician noticed that it began to retain more and more, showing that the fistulous opening was closing. Improvement in this direction continued until the twelfth of August, when the bladder had fully regained its power of retention, indicating that the fistula had closed.

"At this date (August 12th) her health is as good as it ever was. In short, the recovery of the mother is complete, and the baby, which was left at home, prospered for a time, but died when eighteen days old, from bad feeding and care.

"The notes here given of the case while in the hospital are brief extracts taken from the clinical records kept by the resident physician, Dr. McPharlin, to whose skill and constant care her complete recovery is largely due.

"In reviewing this case of gastro-elytrotomy, the second successful case on record, so far as I know, I may say that a more unfavorable case for operating could not well be imagined.

"The conditions of the patient in every particular relating to the operation, and the want of facilities for after-treatment, were such as to thoroughly test the merits of this method of delivery. Certainly, greater difficulties than were here encountered are not likely to occur in the future history of this operation."

Availing myself of my personal acquaintance with Dr. Skene, I have several times questioned him about the details of his operations, and am, through his kindness, enabled and authorized to add the following items. In his last operation he did not see the epigastric artery at all, while in that preceding it he saw it and the accompanying vein, like the embroidered lines on the back of a glove, and pushed them inside and upward. The superficial or external epigastric was cut and temporarily compressed with a holding-forceps in every case. He did not twist or tie a single vessel. The external incision did not extend down to the spine of the pubis, but ended above it. He had made the incision rather too near to Poupart's ligament, which, in his last operation, necessitated the extirpation of a large inguinal gland. He thinks it best to keep even more than one inch above the ligament. The peritonæum separated in the first two cases as easily as a rabbit is skinned. The pulsating vessel, which he felt before incising the vagina in his first case, was felt running in the direction of a prolonged radius from the os uteri outward. He made his incision in front of it, but is not sure if he tore it, as it may have staid intact in the posterior part of the vagina. He introduced his right hand and cut with the left. He cut in a direction parallel to the ilio-pectineal line. He estimates the distance from the utero-vaginal junction at scarcely half an inch in the centre, but greater toward the symphysis and the rectum. The incision was just long enough to admit the end of both fore-fingers. He introduced them perpendicularly to the incision, and applied the force in the direction of the vaginal axis. This gave a transverse rent, which he extended by applying his fingers in the same way, in different places, nearer to the symphysis, and then nearer to the sacrum; thus making a rent that he saw distinctly in his first two operations, but not in the third, on account of the deformity of the patient, and the disturbance caused in the tissues by previous inflammation. It was ragged, but had no branches; it was simple, not stellate, and about three inches long. He was surprised at the facility with which the wall tore. On account of the elasticity of the tissue the hand entered easily through this opening without tearing it more. In his second

case he carefully examined the vaginal rent after delivery, looking for vessels, and he is positive that it was a simple transverse rent. On account of this he doubts if it is possible to perform the operation on the left side, as the distance from the rectum to the bladder is smaller on this side than on the right. He did not see nor feel the large iliac vessels, which were covered by the uterus.

The indication seems to have been absolute in the first case, since not even craniotomy was thought practicable, on account of the narrowness of the pelvis, combined with the œdema of the genitals, although cephalotripsy is not mentioned. In the third case the indication was unquestionably an absolute one, on account of the great contraction of the pelvis. In the second it was only conditional; but the operation was justified by the experience from the patient's former deliveries, and her great desire to have a living child.

When Dr. Skene formulates as a general indication that gastro-elytrotomy should be "tried in place of craniotomy, when the life of the child could be saved by so doing," I think he goes too far. This operation being much more hazardous than cephalotripsy, cranioclasis, and decollation, under favorable circumstances, it ought only to take the place of operations by which the fœtus is broken up, if these operations, in the given case, would present particular difficulties, as in Dr. Thomas's second case. Under circumstances favorable for craniotomy or embryotomy, gastro-elytrotomy would only be justifiable in the hands of those who absolutely refuse to kill the fœtus, and who consequently either would expose the woman to greater danger by non-interfering, or by Cæsarean operation; but this is not good obstetric practice.

Apart from the regard to the greater safety to the mother in cases in which difficult embryotomy, in the wider sense, would be the alternative, gastro-elytrotomy may also be justifiable, like Cæsarean operation, if the woman is willing to undergo the operation, and great interests, such as the preservation of a dynasty, or the entailment of a large estate, etc., are at stake. Since it is less dangerous than Cæsarean section, it is even warrantable to let the interest of the child weigh more than when the latter operation is contemplated.

It is fortunate that the only man who, besides Dr. Thomas, has performed this operation since its reinvention, had never witnessed the experiments and the operation performed by the latter. By performing the operation three times, and once even under the most difficult circumstances, Dr. Skene has proved that it is fit to become the common property of the profession. What has succeeded in Brooklyn, at the hands of a man who had merely read Dr. Thomas's description of his operation performed in New York, may as well succeed in any other part of the civilized world, provided that he who undertakes it is capable of operating at all. According to the unanimous testimony of all who have tried it, it is not even a difficult operation. Ovariotomy, an operation in which the unforeseen plays a much greater part, and in which often the greatest difficulties are met with, has been performed successfully numbers of times by village doctors. How much more readily then may gastro-elytrotomy be undertaken, an operation that indeed is dangerous, but in which the danger is much less under the control of the skill of the operator! This must of course not be misconstrued as if I meant that anybody can do what Dr. Skene can do, who is a consummate surgeon. I only mean to say that *the operation in itself is not one of those that demand such skill that they necessarily can be performed only by few men.* There cannot be any serious difficulty in the first part of the operation, the abdominal incision and the separation of the peritonæum. The only delicate point, to cut the fascia without wounding the peritonæum, is not so difficult as to incise the hernial sac without injuring the gut, the first two being separated by cellular tissue and often fat, while the latter are in contact. The second part may be made comparatively safe by opening the vagina with the actual cautery and then tearing. If the rent extends into the bladder, experience has shown, in Dr. Thomas's second and Dr. Skene's third case, that the fistula may heal by itself. If it does not, and the operator does not feel competent to close it, this part may be performed later by another. In order to ascertain, immediately after the operation, whether a fistula has been formed or not, I should advise to *inject lukewarm milk into the bladder*, which would enter

the vagina, and would be easily recognized by its color. The rupture may then be united at once by a few stitches.

It is likewise fortunate that the few cases hitherto operated on in America have varied so much that they prove that the operation, with proper modifications, is practicable under different and even the most trying circumstances. The child has presented by the head, by the breech, by the arm and cord; there has been considerable narrowness of the pelvis and anchylosis of both hip-joints; and the woman has been delivered by version, extraction, and forceps.

It appears from the above that there is some difference between the statements of Dr. Thomas and Dr. Skene as to the important question of *the size and the shape of the vaginal rent.* But one thing has become entirely clear: both *applied the force in precisely the same direction*, although with different aim. It is, therefore, likely that the result was the same, and that the chief direction of the rent was one parallel to the brim of the pelvis. The chief direction of the muscular fibres favors the separation in this oblique line. I have tried myself to tear the vagina on the cadavers of non-pregnant women, after having made a small incision below and parallel to the ureter, and applying the force perpendicularly against the edges as in the operation. The opening became only longer, but retained its chiefly transverse direction, and did not tear at all in the direction in which the force was applied. If I made an incision in the direction of the longitudinal axis of the vagina, and tore, the rent retained indeed also this direction, but tore with less facility. Thus *it seems that we can decide the direction of the rent by the direction in which the incision is made.* Whether the rent will become stellate or not will, probably, to a great extent, depend upon the rapidity with which the fœtus is expelled or extracted. As it is impossible to tell in what direction, and to what extent, the branches might go, thereby endangering not only the bladder, that actually has been invaded, and the wound in which is of less consequence, but the ureter and the peritoneal cavity, which might prove fatal, it must be safer to try to avoid them.

Intimately allied to this question is that about the *possibility of operating on the left side.* We have seen that Bau-

delocque did so in both his cases, and was able to extract the fœtus through the wound in the second. But he *cut*, and could consequently give his incision so oblique a direction that he obtained room enough; but cutting is so hazardous that it has to be avoided in future, and the question is then if tearing will give as good results on the left side as on the right. It appears likely from my experiments, but it has yet to be proved in practice. I shall hereafter show that there is plenty of room, although the rectum lies in this side of the body. Dr. Thomas says that his last patient will almost surely return within a year,[1] and that he would repeat the operation. He would then have an opportunity to examine this important question on the living subject. I would also call to this point the special attention of those who may be fortunate enough to have at their disposal the body of a woman who has died at term. *Let them by all means try the operation on the left side, and cut below and parallel to the ureter and the line of connection between the bladder and the vagina* (*see* Fig. 2), *but not more than absolutely necessary to introduce their two fingers, and then tear.* This is the point that, more than any other, needs investigation now; the feasibility of the operation on the right side having been put beyond a question by the success of Drs. Thomas and Skene.[2]

[1] *L. c.*, p. 245.

[2] I have just received Masson's "Thèse: De la Gastro-élytrotomie," Argenteuil, 1878, which contains (page 48) the report of an operation made *on the cadaver*, April 12, 1877, by Budin and Thévenot. They operated indeed on the left side, and extracted a rather large child with great facility, and the following dissection showed that the peritonæum, as well as the bladder and the rectum, was intact. They found, like their predecessors, that it was easy to detach the peritonæum, and reach the vagina. Two fingers of the left hand were introduced into the vaginal canal, and fixed a little in front of (or below) the scarcely perceptible ring formed by the fully dilated os uteri. They made the incision between these two fingers separated from each other. The vaginal wall seemed so thick that the operator for a moment questioned if he did not incise the uterus. The incision was extended a little forward and backward, in order to give passage to the hand and the child. This, as well as Baudelocque's second case, gives good hope of the feasibility of the operation even on the left side; but as they made the whole opening by incision, we cannot draw any positive conclusion as to tearing.

Name.

When we look in Dunglison's "Dictionary,"[1] under the head of Gastro-elytrotomia, we should think that it is a very common operation, since it bears no fewer than five names—*Gastroëlytrotomia*, *gastrelytrotomia*, *gastrocolpotomia*, *laparocolpotomia*, *laparoëlytrotomia*—but this can only be regarded as a display of philological scholarship. When we take the thing historically, it looks a little different. The operation was called by its first inventor, Ritgen, in 1820, *Bauchscheidenschnitt*, which, Grecized, would be either *gastro-elytrotomy* or *laparo-elytrotomy*. Baudelocque, its second inventor, called it *gastro-élytrotomie* in 1823, and in his second publication, in 1844, *élytrotomie*. Dr. Thomas, its last inventor, called it *gastro-elytrotomy* in his first paper (1870), and so did Dr. Skene; but in his last paper (1878), Dr. Thomas called it *laparo-elytrotomy*, and substituted this word for gastro-elytrotomy in reproducing the earlier publications.

The whole question is of little account, and Dr. Thomas has certainly, more than any other living man, the right to name the child. From historical grounds, it would be right to keep the name given by Ritgen; but as it is German, it has to be translated, and may be translated in both ways. As one of the two was used originally by Baudelocque, and later by Dr. Thomas himself, it seems to me to be preferable, so much more so as there cannot be said anything against it. *Γαστὴρ* signifies as well *abdomen* as *stomach*. *Gastrotomy* signifies indeed the opening of the stomach, while *laparotomy* is the opening of the belly (*λαπάρα*, properly the *flank*, the soft part between the ribs and the iliac crest); but as a term designating an incision through the stomach and the vagina would be meaningless, and as *gastro-hysterotomy* is much more used than *laparo-hysterotomy* for Cæsarean section, it seems better to call its substitute *gastro-elytrotomy*.

Statistics, Dangers, Indications, and Contra-indications.

There can of course not be spoken of any statistics for the first period. The operation was in two cases given up, and

[1] Robley Dunglison, "Dictionary of Medical Science," Philadelphia, 1874.

Cæsarean section performed, resulting for the mother in death from hæmorrhage. In Ritgen's case, the child survived; in Baudelocque's it was dead. The operation was only performed once—the mother died from peritonitis—the child had died in consequence of the mother's eclampsia. The same condition, besides a defective *modus operandi*, may have exercised some influence on the result for the mother.

During the second period, five operations have been performed—four of the children were born alive, and three of the mothers are still living. But the record is still much better, when we remember that the fifth child had had its head perforated before the operation, and that both of the mothers who were lost were in a dying condition when it was undertaken.

Of the children, one died shortly after birth, being only a seven months' deformed fœtus; another after eighteen days, from want of care.

This result is not only most remarkable in a dangerous operation undertaken in the gravest cases of obstetric practice, but it becomes still more so when we compare it with the results of *Cæsarean section*. Of course nobody can foresee what experience will show to be the real statistics of gastro-elytrotomy when it has been performed often enough to exclude the influence of chance. It is not likely that the result will continue so good as it has been in the five operations hitherto performed according to Dr. Thomas's method. But in order to know if it is right or wrong to try it, we must consider the result so far obtained. The statistics of gastro-elytrotomy have the great advantage of being complete, while others regarding operations performed many times are based on literary sources in which successes are more frequently reported than failures. Thus all general statistics published on Cæsarean section are entirely fallacious, although, even as they are, they show the great danger of the operation. The most recent collection of the kind, that of Mayer, shows in 1,605 women a mortality of fifty-four per cent.; the same figure was obtained by Michaelis, while Kayser even found sixty-two per cent.[1] Dr. Robert P. Harris, of

[1] Spiegelberg, "Geburtshülfe," Lahr, 1878, p. 852.

Philadelphia,[1] has gathered eighty-nine operations performed in the United States. Of the mothers thirty-eight lived and fifty-one died, or 57.3 per cent. Of the children forty-four were born alive, thirty-eight continued living some time, forty-seven were born dead, i. e., 51.6 per cent. The author insists justly on the comparatively favorable results obtained when the operation is performed within twenty-four hours after the commencement of labor, but even under these circumstances the results are inferior to those hitherto obtained by gastro-elytrotomy. If we take more limited localities, where it is easier to ascertain the results of Cæsarean section, the report is by far darker. Joulin[2] states that it has been performed sixty-seven times in Paris since the sixteenth century, and six women only escaped death. The last successful operation was performed by Lauvergeat in 1787. *During this century twenty-six operations have been performed without a single success.* Späth[3] says that there has not been a single case in the Lying-in Asylum of Vienna, during this century, in which the mother survived. Stadfeldt[4] has collected the cases reported in the three Scandinavian countries during the last twenty-five years. They were—for Sweden five, for Norway ten, for Denmark four. *Of the nineteen women only one survived.* Of the children six were dead before the operation; of the remaining thirteen eleven were born alive, and ten continued to live for some length of time. In New York and its suburbs there has only been one operation resulting in the survival of both mother and child, since the incorporation of "Nieuw Amsterdam" in 1621.[5]

It has often been said that the experience gained in ovariotomy would render the results of Cæsarean section better, but the prediction is yet to be fulfilled. Späth makes the above statement in reporting four cases operated on by himself,

[1] *American Journal of the Medical Sciences*, April, 1878, vol. cl., pp. 336–342; July, 1878, vol. cli., pp. 69–76.

[2] Joulin, "Traité complet d'Accouchement," Paris, 1867, p. 1092.

[3] *Wiener med. Wochenschrift*, January 26, 1878.

[4] Stadfeldt, "Det mekaniske Misforhold under Fôdselen" (The Mechanical Disproportion in Childbirth), Copenhagen, Denmark, 1872, p. 156.

[5] Thomas, "Comparison of the Results of Cæsarean Section and Laparo-elytrotomy in New York," New York Medical Journal, May, 1878.

which all proved fatal. Ovariotomy has been steadily performed in the Scandinavian countries these last fifteen years, with very fair results, and we have just seen what has been obtained in Cæsarean section in those parts. Spiegelberg, who has only operated after ovariotomy had become a common operation, has performed Cæsarean section five times, and never succeeded.[1]

Even if we take the crude facts of the six only operations of gastro-elytrotomy ever performed, and not even make any allowance for a perforated head, we have for the mothers three recoveries, three deaths, or 50 per cent.; for the children, four born alive, two dead, or 33 per cent. Even these entirely unjust figures compare favorably with those of Cæsarean section; and while the first are complete, the latter are utterly incomplete. Thus even statistics ought to engage obstetricians to give gastro-elytrotomy a fair trial. But the number is so small that the proportions may be altogether changed by a single new case. Let us therefore compare the operations themselves.

The first step, the incision through the abdominal wall to the peritonæum, is identical in both as to danger. The second step in gastro-elytrotomy, the separation of the peritonæum, is, by all who have tried it on the woman at the end of pregnancy, declared to be easy. I have myself found it very easy on the cadavers of non-pregnant women. The third step, the incision of the vagina, may be made almost safe by using cauterization and tearing instead of cutting, and has even been performed in the latter way without causing hæmorrhage. In the vagina there are comparatively small vessels which may bleed or may not, and which in the last six operations out of eight, which are all those in which the operation has been at all attempted, in fact have not bled. Should they do so, there would still be a fair chance that the hæmorrhage would stop after delivery, as it did in Ritgen's case, or might be controlled by ligature, temporary compression, the tampon, the actual cautery, or styptics. In the body of the uterus, on the contrary, there is the certainty of cutting the large sinuses, besides the additional possibility of encountering the placenta.

[1] Spiegelberg, *l. c.*, p. 853.

As to *primary hæmorrhage*, then, the danger is much greater in Cæsarean section than in gastro-elytrotomy. The fourth step, the extraction of the child, has proved easy in all cases excepting one, in which there was great deformity, and even then the difficulty was overcome. In Cæsarean section this step is sometimes rendered very difficult and dangerous to the child, by the contraction of the womb around its neck. The fifth period comprises all the time from delivery to recovery or death. This is the most dangerous period in gastro-elytrotomy, but even here the dangers are less than in Cæsarean section. The peritoneal cavity not being opened, the patient is less likely to die from *shock*. *Incarceration of intestines*, which may occur in Cæsarean section, is excluded in its rival. *Metritis* is not more likely to occur in gastro-elytrotomy than in any other difficult labor, and is of course infinitely less likely to follow than in an operation by which a large wound is made through the wall of the uterus. *Peritonitis* may indeed occur, as it did in Baudelocque's case; but, the peritoneal cavity remaining intact, it is much less likely to occur than in Cæsarean section, in which the cavity is opened to a large extent, and the membrane wounded by two large incisions. A necessary sequel of gastro-elytrotomy is *cellulitis*, but this is in its nature not so fatal as peritonitis. *Septicæmia* is a danger common to both; but while in Cæsarean section, besides originating in the wounds, it may be the consequence of blood being decomposed in the peritoneal cavity after the operation, in gastro-elytrotomy the latter danger does not exist, and the whole wound is accessible to thorough disinfection. *Secondary hæmorrhage* may occur in gastro-elytrotomy, but would probably be controllable by ligature, styptics, or tampon; in Cæsarean section it occurs often on account of the relaxation of the uterus, and is fatal.

Thus the *a priori* argument, as well as the results hitherto obtained, are in favor of the new operation.

The same may be said in regard to the new modification of Cæsarean section, by which the whole supra-vaginal uterus is extirpated, as done by Porro, Späth, C. Braun, and P. Müller.[1]

[1] *Centralblatt für Gynäkologie*, 1878, No. 5, vol. ii., p. 98.

Dr. Thomas has only proposed gastro-elytrotomy as a substitute for Cæsarean section, and declined to discuss it in relation to embryulcia in the New York Academy of Medicine. The operation is much too new to enable us to have even an approximate idea of the fatality inherent in it. Only when this is known will it be time to give exact rules as to when it is indicated. As yet we can only point out when it ought to be *tried*. Now, Dr. Parry,[1] in a paper on "The Comparative Merits of Craniotomy and the Cæsarean Section, in Pelves with a Conjugate Diameter of Two and a Half Inches or less," has shown that, in the hands of the most skillful operators, craniotomy performed under these circumstances gives no better results than Cæsarean operation. He has tabulated 70 cases, of which 26, or 37¼ per cent., were fatal. Dr. Harris[2] has grouped together those of his cases of Cæsarean section that had occurred in cities and large towns, where they may be supposed to have had similar advantages as to skillful treatment. They number thirty-two, with a saving of twenty women and sixteen children, i. e., the mortality among the mothers was 37½ per cent., and among the children 50 per cent. Thus the mortality among the women upon whom craniotomy was performed was almost exactly the same as when Cæsarean section was performed; and while in the former all the children were sacrificed, in the latter fifty per cent. were saved. Under these circumstances it would therefore also be warrantable to try gastro-elytrotomy instead of *craniotomy*.

Bad cases of *embryotomy*, especially those in which it would become necessary to take away large parts, such as the liver and the lungs, will be likely to prove much more dangerous to the mother than gastro-elytrotomy, apart from the sacrifice of the fœtus. Thus the operation may be undertaken even when the child is dead, and to the mother's sole benefit.

After having pointed out cases in which the operation ought to be tried, we may also call attention to circumstances in which it would be contraindicated. The operation *cannot be repeated on the same side*, as it would be impossible to separate the peritonæum, and lift the vagina. When the *head is*

[1] *American Journal of Obstetrics*, 1872, vol. v., p. 644.

[2] *American Journal of the Medical Sciences*, April, 1878, p. 323.

wedged into the pelvis, so that it cannot be pushed up, the incision of the vagina becomes impossible. If some solid *tumor*, for instance a fibroid, fills up the vagina, the same is the case. If the *obstruction* takes place *in the uterus* itself, as in cases of fibroid or cancer, the operation is of course contraindicated; likewise in cases of *atresia* or *coarctation of the vagina*, because this organ would not be distensible enough.

Anatomy.

It is not my intention to give a description of all the parts interfered with in gastro-elytrotomy, but it may be well to recall certain points of the regional anatomy, and to add certain facts that will in vain be sought in treatises on anatomy. I think the simplest way will be to treat the subject exactly in the same order as the operation is performed.

1. Abdominal Incision.—By beginning the incision one inch and three-quarters above and outside of the spine of the pubis,[1] we avoid the round ligament and the epigastric artery.

During the incision of the skin the *external epigastric* or *superficial abdominal artery* is severed. It is a small branch that starts from the femoral an inch or less below Poupart's ligament, and runs in front of it in the subcutaneous cellular tissue up to the umbilicus.

The *external oblique muscle* is aponeurotic throughout the incision except just above the anterior superior spine of the ilium, where the fleshy part may be reached.

The fibres of the *internal oblique* run almost horizontally in this locality; those of the *transversalis* descend a little. These two muscles are fleshy in the greater part of the wound, but aponeurotic toward its inner extremity.

The *rectus muscle* is not interfered with.

The *transversalis fascia* is rather thick and dense in this locality. It is separated from the underlying *peritonæum* by a layer of areolar tissue in which often is found a deposit of

[1] This is the term by which English and French anatomists (Gray, Sappey) designate the small protuberance in which the ilio-pectineal line ends inward and forward, while German anatomists (Holstein, Krause) call it *tuberculum pubis*. Holstein uses *spina pubis* for designating the *anterior* border of the pubis.

fat. In the pregnant state this tissue becomes much looser still than in the non-pregnant, so that it allows the fascia and the peritonæum to be separated with great facility.

The *epigastric artery* starts from the anterior and internal circumference of the external iliac, one-quarter of an inch above Poupart's ligament, runs between the transversalis fascia and the peritonæum downward, forward, and inward, about half an inch, to the ligament, turns here upward and inward, passes in front of the round ligament, inside of the internal abdominal ring, behind the inguinal canal, outside of the internal inguinal fossa. Next it passes behind the posterior layer of the sheath of the rectus muscle, and enters finally the muscle itself. It crosses the round ligament at right angles. Generally it will not be reached by the incision; but since Dr. Thomas cut off a protruding piece of the ligament in his second case, he came in close proximity to the artery, and Dr. Skene once laid it bare without injuring it.

The circumflex iliac artery starts from the external iliac, opposite or a little below the epigastric, runs between the peritonæum and Poupart's ligament to the anterior superior spine of the ilium, and continues its course inside the crest. Thus this artery does not come under the knife; but in separating the peritonæum it will be between the back of the fingers and the ligament. It is a vessel of small calibre, that has not even been noticed by the operators.

2. Lifting of the Peritonæum.—Beyond Poupart's ligament the transversalis fascia is continued as the *iliac fascia*. It adheres in front to the peritonæum by exceedingly loose areolar tissue. It covers the *internal iliac* and *psoas muscles*, between which the *crural nerve* is situated. At the inside of the psoas muscle, between the peritonæum and the fascia, lies the *external iliac artery*, extending from the upper end of the sacro-iliac articulation to Poupart's ligament. It has the corresponding vein on its inner side throughout on the left side of the body, and during the greatest part of its course on the right side, but in the uppermost part on the right side the vein lies outside the artery and crosses behind it.

The internal iliac or hypogastric artery runs, from the point where it separates from the external, forward and downward, and then it dips perpendicularly into the excavation of the pelvis, in front of the sacro-iliac articulation. It is only from three-quarters of an inch to one inch and a half (2–4 centimetres) long (Sappey [1]), accordingly not favorable for ligature. The corresponding *vein* runs behind it and inside of it.

3. Vaginal Incision.—First of all it must be remembered that the operation is only performed toward the end of pregnancy and when the pelvis is narrow. *Consequently the whole uterus with the fœtus is above the pelvic brim.* The *vagina* becomes so enlarged during pregnancy that, although it is drawn up to the brim by the ascending uterus, it forms large folds in order to be large enough to give passage to the child. Its wall becomes thick, but its tissue very loose, so that, although highly dilatable in the unimpregnated state even, it becomes still more so during pregnancy. The same is the case with the areolar tissue that binds it to the surrounding parts. Thus the whole organ may be lifted more or less considerably out of the pelvis and the operation performed above the pelvic brim. Even in the unimpregnated state of women who have borne children, it can easily be lifted a couple of inches up from the position it holds by gravity. The vagina has a thin external layer of cellulo-fibrous tissue interspersed with elastic fibres. The bulk of it is formed of muscular fibres spreading like a fan from the region of the sacro-iliac articulation above and the pubis below, as shown by Rouget.[2] When a small incision is made parallel to the ureter and torn, it keeps the same direction. Innermost is the mucous membrane.

The vagina is rich in vessels. On either side comes a branch called the *vaginal artery*, directly from the hypogastric. Besides, the trunk of the *uterine* artery runs in the upper fourth of its borders up toward the uterus, sending down a branch along the border to anastomose with the first.

[1] Sappey, "Traité d'Anatomie descriptive," vol. i., part 2, p. 472.

[2] Courty, "Maladies de l'Uterus," Paris, 1866, p. 59.

Other arterial branches are derived from the *inferior vesical*, *the internal pudic*, and the *hæmorrhoidal arteries.*

The *veins* accompany the arteries, and form a pretty close venous network all over the walls, but are especially numerous at both extremities of the canal. On either side of the upper end of the vagina is found the *utero-vaginal plexus*, which receives the blood from the *vaginal plexus* below and pours it into the *uterine vein* or veins above.

This disposition of the vessels, apart from other considerations, makes it desirable to make the vaginal incision as low down as possible.

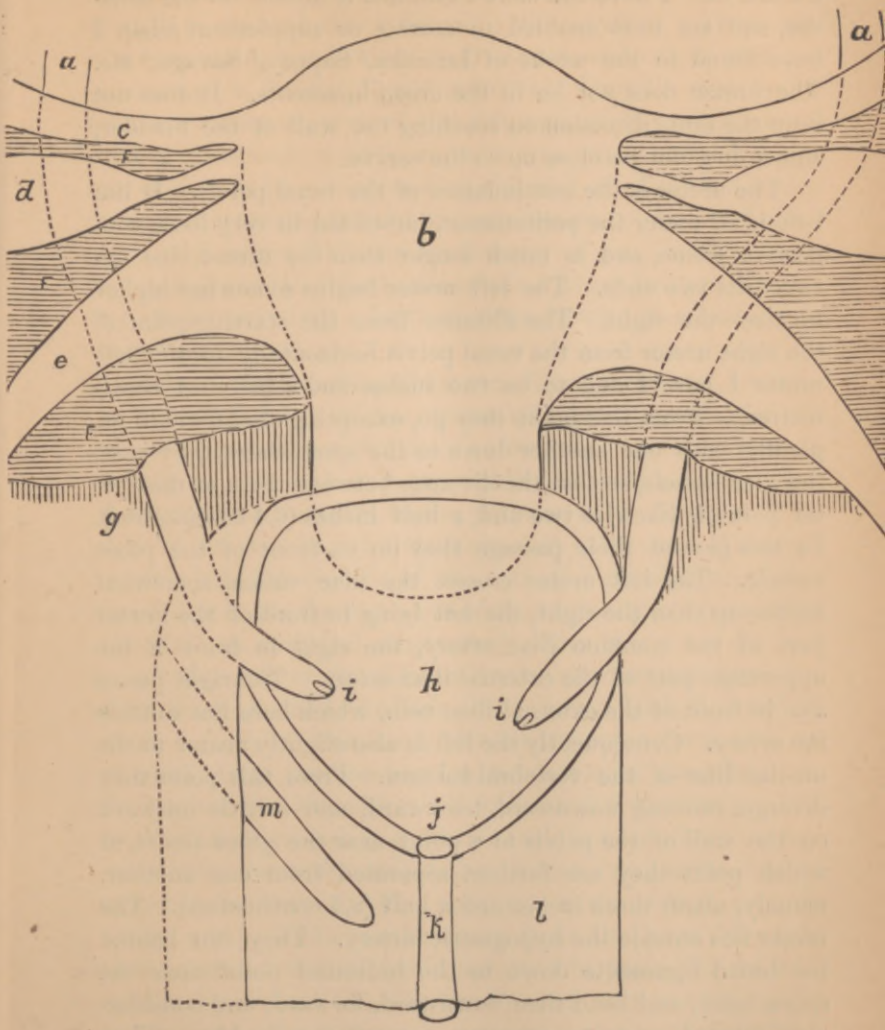
The relations to other organs are of the greatest importance. Behind the vagina is *Douglas's pouch.* This part of the peritoneal cavity varies somewhat in depth; generally it descends seven-eighths to one inch (twelve to fifteen millimetres) on the vagina; sometimes it scarcely touches it, but in other individuals it is in contact with it to the extent of one inch and a quarter (three centimetres) below the uterine junction.[1]

Below the *cul-de-sac* the vagina is in contact with the *rectum*, separated from it by a fascia descending from the pelvic fascia and loose cellular tissue.

The antero-superior surface of the vagina is, in its upper part, bound by loose connective tissue to the *bladder* on a surface that has the shape of a heart. In the lower or anterior part the boundary line of this surface runs parallel to and a little outside of the *trigonum vesicale.* In the upper part it follows the outline of the vagina, from which it passes over to the cervix. The distance from the internal opening of the urethra to the neck of the womb is one inch and a quarter (3.2 centimetres). The bladder extends five-eighths of an inch (1.5 centimetre) up on the cervix (*see* Fig. 2). It is very liable to be reached by the vaginal rent, if the latter is made too high up or too horizontal. The lower part of the antero-superior wall carries in the middle line the *urethra.* In the uppermost part, a little outside of and behind the bladder, lies the *ureter.*

[1] Sappey, *l. c.*, vol. iii., p. 221.

Fig. 2.—Natural Size.



a, Ureters; *b*, uterus; *c*, Fallopian tube; *d*, ovary; *e*, round ligament; *F*, broad ligament; *g*, connective tissue; *h*, bladder (antero-superior part taken away to show attachments); *i*, vesical opening of ureter; *j*, inner aperture of urethra; *k*, urethra; *l*, vagina; *m*, incision and rent in gastro-elytrotomy.

The course of the ureters is not described with the accuracy needed for the science and practice of gastro-elytrotomy and other operations on the female pelvic organs in any anatomy

I know of. I have therefore examined it myself on the cadaver, and am thus enabled to correct or supplement what I have found in the works of Luschka,[1] Sappey,[2] Savage,[3] etc. The ureter does not lie in the broad ligaments. It does not keep the same direction on reaching the wall of the bladder, and it does not lie close up to the cervix.

The ureter is the continuation of the renal pelvis. It lies behind or under the peritonæum, imbedded in very loose connective tissue, and is much longer than the direct line between its two ends. The left ureter begins somewhat higher up than the right. The distance from the starting-point of the right ureter from the renal pelvis horizontally to the left ureter I have found to be two inches and a half (6.4 centimetres). From this point they go, excepting slight windings, parallel with one another down to the spot where they cross the iliac vessels, so that the distance between them at this latter point is likewise two and a half inches (6.4 centimetres). In this part of their passage they lie in front of the psoas muscle. The left ureter crosses the iliac vessels somewhat higher up than the right, the left lying in front of the lowest part of the common iliac artery, the right in front of the uppermost part of the external iliac artery. The right passes also in front of the external iliac vein, which here lies outside the artery. Consequently the left is also slightly nearer to the median line of the vertebral column. From this point they diverge, running downward, backward, and a little outward on the wall of the pelvis to a point near the *spina ischii*, at which point they are farthest separated from one another, namely, about three inches and a half (8.5 centimetres). The ureter lies outside the hypogastric artery. They run behind the broad ligaments down to the indicated point near the spina ischii, and bend then downward, forward, and considerably inward, so as to converge toward the bladder. They

[1] Luschka, "Die Anatomie des menschlichen Beckens," Tübingen, 1864, p. 384.

[2] Sappey, "Traité d'Anatomie," vol. iii., p. 494.

[3] Savage, "The Surgery, Surgical Pathology, and Surgical Anatomy of the Female Pelvic Organs," 2d ed., London, 1870. Pls. iv.–vii. and Pl. xii. (Pl. viii., Fig. 1, is correct.)

pass beneath the base of the broad ligaments, lying in the abundant cellular tissue found in this locality. They cross the cervix at some distance from behind, at an acute angle, so as to come in front of it and below it. They lie outside and above the anterior part of the side-wall of the vagina, if we will suppose such a thing to exist, on a spot as large as the tip of the finger. On reaching the wall of the bladder they turn rather sharply inward and go less downward, until they open with a small slit in the interior of the bladder, at the outer angle of the *trigonum vesicale*. From behind they are seen to be united by a kind of ridge forming the base of the trigonum (Fig. 3).

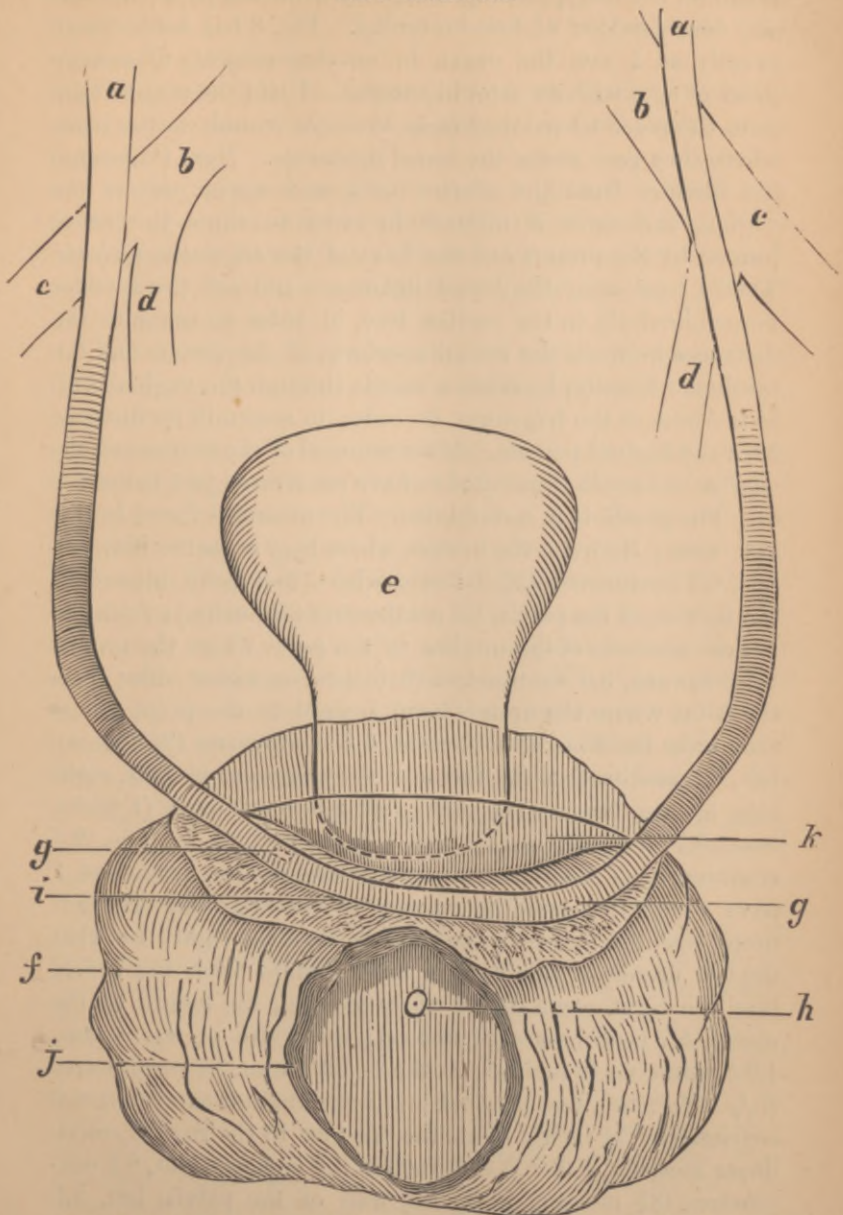
I found the following distances: From the ureter, horizontally, to the horn of the uterus (the starting-point of the ovarian ligament), right, three-quarters of an inch (1.9 centimetre), left, an inch and one-eighth (2.9 centimetres); from the ureter, horizontally, to the junction of the body and the neck of the womb, right, three-quarters of an inch (1.9 centimetre), left, five-eighths of an inch (1.5 centimetre); from the ureter to the nearest point of the vaginal portion on either side, half an inch (1.3 centimetre); from the ureter where it enters the wall of the bladder to the utero-vaginal junction, right, three-quarters of an inch (1.9 centimetre), left, five-eighths of an inch (1.5 centimetre); this point is on a level with the os uteri; from the opening into the cavity of the bladder to the vaginal portion, right, half an inch (1.3 centimetre), left, five-eighths of an inch (1.5 centimetre); between both ureters, where they reach the wall of the bladder, two inches (5 centimetres); between the two openings of the ureters into the cavity, one inch (2.5 centimetres); from the point where the ureter passes under the broad ligament to the point where it reaches the wall of the bladder, one inch and one-eighth (2.9 centimetres); the course of the ureter in the wall of the bladder, nine-sixteenths of an inch (1.4 centimetre); from the opening of the ureter into the cavity of the bladder to the centre of the anterior lip of the os, right, three-quarters of an inch (1.9 centimetre), left, one inch (2.5 centimetres); these openings lie below the level and considerably in front of the vaginal portion; from the internal opening of the

urethra to the os uteri, one inch and a quarter (3.2 centimetres).

These measures are taken from the body of a woman about forty years old, who had borne children, and died from malarial fever and heart-disease. The abdominal organs were healthy. Most of the measures have been compared with those on two other bodies, and the differences are of no importance for our operation. They are represented in Fig. 2. If some mathematical spirit should find slight contradictions in the measures as stated above when the distance from one point to different others is indicated, or between the text and the diagram, it must be remembered that the parts measured are soft, elastic, and movable, so that they easily give way a little even when great care is taken to steady them. As to the diagrams, I do not pretend to be a draughtsman, but I think that even an imperfect sketch may contribute to the understanding of the operation. All the measures are taken *in situ*. This is absolutely necessary, for the organs are so lax that, when examined after removal from the body, all the distances appear much larger than in the body; but this shows, on the other hand, that in operating we may obtain much more room than is shown on the diagrams. Thus I found on a fresh specimen I had removed from the body the following distances: From the ureter to the horn of the uterus, 6 centimetres (2⅜ inches); from the ureter to the junction of the body and the neck of the womb, 4.5 centimetres (1¾ inch); from the ureter to the vaginal portion, 2.5 centimetres (1 inch); from the point where the ureter enters the wall of the bladder to the vaginal portion, 2.0 centimetres (¾ inch); from the opening into the vesical cavity to the vaginal portion, 4.0 centimetres (1½ inch); between the ureters on a level with the os uteri, 7.0 centimetres (2¾ inches); on reaching the bladder, 6.0 centimetres (2⅜ inches); on opening into the cavity, 3.8 centimetres (1½ inch); the length of the ureter in contact with the vagina before entering the bladder, 2 centimetres (¾ inch); the length of its course in the vesical wall, right, 3.0 centimetres (1⅛ inch); left, 2.5 centimetres (1 inch).

Fig. 2 is somewhat theoretically constructed, that is to say, I have made the diagram with the measures actually

Fig. 3.—Natural Size.



Curve formed by the ureters and the base of *trigonum vesicale*: *a*, ureter; *b*, common iliac artery; *c*, external iliac artery; *d*, internal iliac artery; *e*, uterus (appendages cut off); *f*, bladder (dissected from uterus and roof of vagina, a little beyond the base of the *trigonum*); *g*, site of vesical aperture of ureter on the inside (not visible); *h*, vesical aperture of urethra; *i*, base of *trigonum*; *j*, incision in bladder; *k*, vagina.

taken on the body, putting them down on the paper without any consideration of foreshortening. Fig. 3 has been drawn exactly as I saw the organ in another subject, fifty-seven years of age, with an atrophic uterus. I laid the ureters bare from the place where they cross the iliac vessels to the place where they pass under the broad ligaments. Next I dissected the bladder from the uterine neck and upper part of the vagina, and drew it forward in order to show the curve formed by the ureters and the base of the *trigonum vesicale*. Then I took away the broad ligaments and cut the bladder perpendicularly in the median line, in order to measure the distances between the vesical apertures of the ureters and the urethra. Finally, I pushed a needle through the vaginal wall at the base of the *trigonum*, in order to ascertain its distance from the vaginal portion. After removal of the uterus and the vagina, the needle was found to have penetrated just below the os. The sketch is in natural size. The measures found in this case were: Between the ureters where they cross the iliac vessels, 6.7 centimetres (2⅝ inches); where they bend inward at the bottom of the pelvis, 8.5 centimetres (3⅜ inches); from the vesical aperture of the urethra to the point where the ureters bend inward, 5.0 centimetres (2 inches) on either side; from the point where the ureters bend inward to the point where they cross the iliac vessels, right, 5.5 centimetres (2⅛ inches), left, 6.5 centimetres (2½ inches); the *trigonum vesicale*, right side, 3.0 centimetres (1⅛ inch), left, 2.5 centimetres (1 inch), base, 3.7 centimetres (1½ inch); from urethra to base, 2.5 centimetres (1 inch); in all four bodies I have examined I have found the same asymmetry of the trigonum, the left ureter opening nearer to the urethra than the right; but that the left ureter in this case is more distant from the cervix than the right seems to be an exception; the length of the uterus, 5.7 centimetres (2¼ inches); the width at the fundus, 4.9 centimetres (2 inches); at the os internum, 2.7 centimetres (1 1/16 inch); midway between os internum and externum, 2.9 centimetres (1⅛ inch); from the bladder to the rectum, rectilinear measure, left, 6.0 centimetres (2⅜ inches), right, 8.5 centimetres (3⅜ inches); along the wall of the pelvis, left, 9.5 centimetres (3¾ inches), right, 10 centimetres (4 inches); from

the vesical aperture of the urethra to the rectum following the brim of the pelvis, left, 15.5 centimetres (6 inches), right, 21.0 centimetres (8¼ inches).

The ureter lying behind and below, not in, the broad ligaments, it retains its place when the uterus rises during pregnancy.

Since the ureter only touches the vagina on a small spot in the upper and anterior corner, if I am allowed to use such an expression, and at some distance from the uterus, we can understand how it is possible to extirpate this organ without injuring the ureter.[1]

The description will also serve to explain the occurrence of fistulous communications between the ureter and the cervix, or the vagina.

In order to avoid the ureter and the bladder, the incision of the vagina should be made nearly an inch and a half (3.8 centimetres) below the uterus, and in a direction parallel to the ureter and the boundary line between the bladder and the vagina (Fig. 2, *m*). If this incision appears so small that it would be impossible to extract a child through it, I will only state that on the vagina of an unimpregnated woman I have been able to make it two inches long. When we now bear in mind the enormously enlarged proportions we find when we explore a woman at the end of the first stage of labor, I have no doubt that it may be made twice that length. We

[1] After I had finished my studies concerning the anatomy of gastro-elytrotomy, I became acquainted with Freund's description of his new method of extirpating the uterus (*Volkmann's klinische Vorträge*, No. 133, Leipsic, 1878). In this he refers to a description of the female ureters given by himself in the *Berliner klinische Wochenschrift*, 1869, No. 47. This excellent gynecologist has felt the same dissatisfaction with the description given by anatomists which has prompted me to investigate the subject. I am glad to see that in most points we agree as to the course of the ureters. Thus my description may serve to corroborate his, and *vice versa*. When he gives the distance from the ureter to the os uteri as 4 centimetres or more on the right side, and 2.5—3.4 centimetres on the left, and that between the ureters on a level with the external orifice of the womb as 7.9—9.8 centimetres, I feel inclined to think that he has measured on specimens removed from the body, for, as stated above, the distances appear much larger when these lax parts are taken out and spread on the table.

feel the vagina as wide as the pelvic brim, and the above figures show, then, that there is ample room on either side between the urethra and the rectum. The tissues incised being extremely elastic, the child may be extracted through such an opening.

Operation.

The bowels having been emptied by an aperient and a copious enema, and the os having been fully dilated by Barnes's water-bags, if it is not so already, the patient is placed on her back, on a long, narrow table covered with a mattress or quilts, rubber or oilcloth, and a sheet. The pelvis is well elevated on a hard cushion, the head and shoulders slightly raised by means of pillows, the legs stretched out. If, from some cause, it has been impossible to dilate the os fully by Barnes's dilators, it is now done by the fingers, or if that is impossible too, it is dilated later through the abdominal wound. The patient is anæsthetized. Since disinfection cannot be carried out strictly, and since its administration would give some additional trouble, it is scarcely necessary to operate under disinfectant spray.

The operator takes his place at the right side of the patient. Besides one who administers the anæsthetic, four assistants are needed; one on either side of the operator, and two in front of him. The first assistant, standing at the left of the patient's chest, lays his flat hands under the umbilicus and draws the uterus upward and toward the left, thereby putting the skin in the right iliac region on the stretch. Counter-extension may be made by the assistant placed at the right of the operator. A slightly curved incision is made through the skin from a point one and three-quarter inches (4.5 centimetres) above and outside the spine of the pubis, parallel to, and an inch above, Poupart's ligament, to a point an inch above the anterior superior spine of the ilium. This incision may also be made in the opposite direction from without inward. By a few touches with the edge of the knife the external oblique muscle is laid bare, and spouting branches of the superficial epigastric artery secured by holding-forceps. The abdominal muscles are cut to the same extent, layer by layer,

the external oblique, the internal oblique, and the transversalis, the first of which is aponeurotic. The transversalis fascia is very carefully hooked up with a fine tenaculum, and the knife carried horizontally, so as to make a small opening in it, avoiding the peritonæum that lies beneath it, separated from it by loose areolar tissue, and sometimes fat. A director is introduced through the opening and pushed between the fascia and the peritonæum toward the inner and the outer angle of the wound, and the fascia is cut. The best instrument for this purpose is Key's hernia director, the one which Spencer Wells uses when incising the peritonæum in ovariotomy. It is firm, a quarter of an inch (6 millimetres) broad, slightly curved on the flat, well-rounded at the end, and has on its concave side a groove that stops a quarter of an inch (6 millimetres) from the point of the instrument. Next, the operator places the pulp of his fingers on the peritonæum, separating it from the transversalis and iliac fasciæ, until he reaches the vaginal wall. The second assistant, placed at the left of the operator, holds the peritonæum and intestines, applying a fine, warm napkin under his hands, in order to be sure not to let them slip. The first assistant draws the uterus vigorously upward and toward the left, in order to expose the deeper part of the vaginal wall on the right side. A female silver catheter is introduced into the bladder by the third assistant, placed at the left hip of the patient and held in the known direction of the boundary line between the bladder and the vagina, below the ureter on the side on which the operation is being performed. A blunt wooden instrument, something like the obturator of a cylindrical speculum, only longer, is introduced into the vagina and applied above the linea ileo-pectinea, raising the vaginal wall as much as possible into the abdominal wound. An incision is made parallel to the ileo-pectineal line and the catheter felt in the bladder, as far below the uterus as possible, in order to avoid the ureter and Douglas's pouch, and incise where there are fewest vessels, cutting down on the obturator with Paquelin's thermocautery, the galvano-caustic knife, or simply cautery-irons (table-knives), only heated to *red* heat. The surrounding parts are protected by the application of wet compresses around the place to be cauterized. The incision

made by the cautery is extended forward toward the symphysis and backward toward the promontory by placing the pulp of both index-fingers perpendicularly on the edges, and applying the force in different places in the direction of the os uteri and the ileo-pectineal line, so as to *tear* the vaginal wall as far forward as is deemed safe in regard to the bladder and the urethra, the locality of which organs is ascertained by feeling the catheter held by the assistant, and as far backward as the wound in the abdomen will allow. Now the catheter is withdrawn, the membranes ruptured if the liquor amnii has not escaped before, the uterus tilted as much as possible to the opposite side, and the os drawn with the forefinger into the iliac fossa.

The operator draws the child through the double wound either by simple extraction, or after turning, or by applying the forceps, according to the presentation and other particular circumstances. The placenta is expelled by compressing the uterus, and withdrawn through the wound.

If bleeding occurs, the operator tries to check it by applying ligatures through the abdominal wound, holding-forceps, styptics, or cauteries, using a large wooden tubular speculum; or a Sims speculum may perhaps give easier access to the bleeding vessel than anything else. If it be impossible to check the hæmorrhage, the vaginal wound must be firmly tamponed from below through the vulva and from the abdominal wound with cotton pledgets soaked in cold water and squeezed, and held *in situ* by broad straps of adhesive plaster round the abdomen, as after ovariotomy. Except in the last eventuality, the bladder is distended by injecting lukewarm milk in order to ascertain if this organ has been injured. If so, the fistula is immediately sewed with catgut, which need not be removed. The wound is cleaned by injecting a stream of lukewarm carbolized water (2 per cent.), or a solution of thymol (2 per thousand), from the vagina and from the abdominal wound. Next, the edges of the abdominal wound are brought together by interrupted sutures, and the lower part of the abdomen covered with borated or salicylated cotton, and surrounded by broad straps of adhesive plaster fastened to the hips, as in ovariotomy. A pledget of cotton

soaked in carbolized oil (1 : 10) is applied in the entrance of the vagina.

After-Treatment.—The vagina and iliac fossa are syringed every two or three hours, and the plug in the vagina renewed. The nozzle of the syringe may be carried through the vaginal wound, but the injection ought to be made so carefully as not to interfere with the abdominal wound, in which union by the first intention ought to be attempted. Bodily and mental rest is to be secured, light nourishment, such as milk, gruel, and beef-tea, given according to appetite, pain subdued by opium, which also will keep the bowels quiet for some days. As soon as the temperature rises, or tenderness on pressure appears, a couple of large ice-bags are suspended above the abdomen, so as to touch it without pressing too heavily upon it. Ten-grain doses of quinine, cool baths, or aspersion with cold water on Kibbee's fever cot,[1] may be needed. Meteorism is to be combated by tincture of nux vomica or capsicum (five drops every hour), by injections of oil of turpentine, sulphate of quinine (five grains every four hours, Spencer Wells [2]), or mint water (two ounces of the herb to a quart of water, Peaslee [3]), by large doses of subnitrate of bismuth (gr. xxx.–xl., Koeberlé), by the rectal tube, by puncture of the intestine, especially the transverse colon, or, as recently advised by Dr. Jenks, of Detroit, Michigan, by standing the patient on her head,[4] or by faradization (Wells [5]).

The *time* required for the performance of the operation will of course vary much according to circumstances, and will especially depend upon the occurrence or non-occurrence of hæmorrhage. Ritgen used a little less than an hour, including half an hour spent in waiting for labor pains, and the time occupied in performing Cæsarean section. Baudelocque's

[1] Thomas, "The Most Effectual Method for controlling the High Temperature after Ovariotomy," New York Medical Journal, August, 1878.

[2] Spencer Wells, "Diseases of the Ovaries," London, 1872, p. 388.

[3] Peaslee, "Ovarian Tumors," New York, 1872, p. 503.

[4] E. W. Jenks, "On the Postural Treatment of Tympanitis Intestinalis following Ovariotomy," *American Journal of Obstetrics*, July, 1878, vol. xi., p. 515.

[5] Wells, *l. c.*

operation lasted one hour.[1] Dr. Thomas performed his last operation in thirty-five minutes. Dr. Skene used only respectively ten and fifteen minutes in his first two cases; the time employed in the last is not stated.

As to the time required for recovery, it will to a great extent depend on the healing of the abdominal wound by first or by second intention. In Dr. Skene's second case both wounds were closed on the fourteenth day. In his third there remained at that time only a vesical fistula.

Conclusions.

1. Gastro-elytrotomy ought, when possible (*see* contraindications above), to be performed instead of Cæsarean section in all cases, and instead of operations by which the fœtus is broken up, when these would be particularly difficult, especially when the smallest diameter of the pelvis measures two inches and a half or less.

2. It does not require exceptional skill or rare instruments. It is, indeed, less difficult than ovariotomy and herniotomy.

3. Five assistants are desirable, and four indispensable, in order to carry out the above plan.[2]

[1] "Elytrotomie," p. 24.

[2] Dr. Skene, in his second case, had only three assistants, but then no catheter was used.